THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Conditions in the iron trade continue to work against such an increase in production as consumers have been expecting and hence the lower prices generally predicted are further delayed. In pig iron the indications are for an increase in cost; whether this will mean a higher price to the consumer depends on other things not yet plainly developed. It now seems certain that Lake Superior ores will be enough higher to make pig iron cost $1 a ton more. At the same time the blast furnace workers are renewing the agitation for an 8-hour day in the Mahoning and Shenango Valleys, which would mean 50 percent higher labor cost. Southern furnacemen, whose irons are now higher in the East than foreign and Eastern irons, and are higher than Northern irons in portions of the Central West, now fully expect a 50-cent advance on freights south of the Ohio River on March 15, following the 50 cents added last fall. However, these added costs are not hurrying foundrymen into the market for deliveries in the latter half of the year. Beyond the purchase last week of 15,000 tons by pipe interests, there is no special interest in future requirements. In the Pittsburg district basic iron has been a feature of interest, offerings of Virginia furnaces being lower than recent figures of Valley furnaces. A sale of 3,000 tons of Virginia basic is reported at $21.75 delivered at Pittsburg. A considerable tonnage of basic is likely to be closed in the near future as some large contracts are expiring. Inquiry for Bessemer iron is more active. The prospect of an advance in ore makes furnaces content to wait, and business for late deliveries is not being pushed. Statistics show that furnaces now active and those to start this year would consume 30,000,000 tons of Lake Superior ores in the year ending May 1, 1904. The deadlock between Southern furnaces and the consumers of gray forge irons continues. The furnacemen's minimum, $17 at furnace, is $1 higher than consumers feel justified in paying. Consumption is of course the final test of the high level to which the various increments in labor, freight, coke and ore are bringing prices. The consumer of the finished product will be heard from more distinctly on this point as the open season of the year come on. The high prices for intermediate products—billets, sheet bars and rods—continue to limit buying. A sale of 6,000 tons of billets is reported to an Indiana wire interest. At Chicago a sale of 2,500 tons of German billets has also been made. In the Central West efforts have been made to place German steel, but the smaller finishing mills have named $29 delivered as the price at which they must be able to buy in order to make a profit on the present basis for their products. This is $1 to $2 below the mill quotations for domestic steel. At Atlantic seaboard foreign steel has ranged from $28 to $29 in ordinary lots. There has been good activity in plates and good specifications in bars. Chicago reports 15,000 tons of plates sold. The American Bridge Co. has booked 15,000 tons of bridge and steel building contracts in the past week. Two producers of bars report 10,000 tons specified in a single day, and there is a fair amount of new business in steel bars, but some hesitation in placing contracts for bar iron on the present level. The manufacturers of steel bars at a meeting at Pittsburg decided against any concession from 1.60c Pittsburg to jobbers and large consumers. Tin plate production is on a somewhat larger scale and in view of increased cost in the Indiana gas belt, shipments from those mills will hereafter carry a delivered price based on Pittsburg freights to destination. The report of the absorption of an Indiana wire plant by the American Steel & Wire Co. is without foundation or immediate prospect of any.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, Feb. 4.

There has been little change in the general situation during the past week. The buying of pig iron continues limited on all grades except basic which has been traded in more freely than for some time. While the Northern producers of basic are inclined to hold out for a price only slightly less than that asked for Bessemer, the offerings of the Virginia furnaces have had the effect of slightly reducing the quotations of the Valley furnacemen. A number of contracts which independent steel producers closed a year ago with Virginia furnaces expire during the next two months and the indications are that the buying for future delivery will be extremely heavy. Very little Bessemer iron for delivery during the remainder of the first half is available, although the demand is strong. Consumers are showing little interest in foundry and forge irons and sales are limited almost entirely to small lots for prompt shipment.

In finished lines plates have been more active than for some time, due to the heavy buying of tank manufacturers for deliveries extending over a period of six months. Mills are making somewhat better deliveries on structural material, but it is doubtful if these early deliveries can be continued for any length of time as the amount of new business the mills are receiving is now much heavier than at any time in the past two months. The American Bridge Co., through its local office, closed contracts this week for upwards of 8,000 tons of material and a number of large bridge contracts are pending. Considerable business is also being placed in steel bars, but the large jobbers are still holding off. The stand taken by the large steel bar manufacturers in refusing thus far to make the slight concession that jobbers desire would indicate that fair sized orders from the consumer will be taken by the manufacturers direct, limiting the jobber to the smaller consumer whose trade the mills do not care to handle. There has been talk of fixing of a certain tonnage, say 10,000, on which jobbers and large consumers will get a preferential price.

The tin plate trade is unusually active, nearly all of the mills of the American Tin Plate Co. being in operation at present while more than 50 percent of the independent mills are on in full. Owing to the increased cost of production in the Indiana mills of the American Tin Plate Co., due to the use of coal in the failure of natural gas, and the increased cost of transporting steel to these plants, no further delivered prices will be made based on the freight rate from the mills in this district. Hereafter all prices will be mill price plus the tariff rate of freight from the Pittsburg district to destination. This will somewhat advance the price for Western consumption. The official notice issued to the trade follows: "Please note that prices for our various products will be made f. o. b. cars destination, based on the f. o. b. mill price, plus the tariff rate of freight from Pittsburg district to destination, and that no delivered prices will be made based on the freight rate from

the Indiana district. This action is necessitated through the increased cost of production in the Indiana district, brought about by the higher cost of delivering steel and other raw materials to the mills in that district and to the heavy additional expense incurred through the substitution of coal for gas as fuel in the various plants."

Several days ago one of the large dealers in steel in this district, in order to interest independent sheet and tin plate manufacturers in a prospective purchase of foreign steel, sent letters to a large number of the mills asking them at what price, delivered, they would be interested in purchasing sheet and tin bars. A compilation of the replies indicates that they must have the steel at their mills for $29 per ton in order to make a small margin of profit. As the foreign market is considerably above this figure no orders were placed.

The Cambria Steel Co. is further increasing its open-hearth production by the erection of two 50-ton furnaces which will have an output of about 60,000 tons a year. Plans are now being prepared at Johnstown for a still further increase in the open-hearth capacity and it is stated that when the present plant of improvements is completed the Franklin plant will contain 24 furnaces, sixteen of 50-tons capacity each to be erected in the near future.

PIG IRON.—We note sales of about 5,000 tons of Bessemer iron for delivery through the first half at prices ranging from $21.25 to $22 at the furnace, according to the delivery. We also note the sale of 3,000 tons of Virginia basic at $21.75, delivered in this district. Foundry iron in small lots commands from $22 to $23 per ton, according to delivery. While the shipments of coke to the Valley furnaces continue bad very few stacks are banked and the indications are all in favor of a more regular movement of coke from the Connellsville region in the immediate future. We make the following quotations:

Bessemer, Valley	$21 00 to 22 00
Bessemer, Pittsburg	21 85 to 22 85
No. 1 Foundry	23 00 to 24 00
No. 2 Foundry	22 00 to 22 50
Gray Forge, Pittsburg	21 00 to 21 25
Chilled Basic, Valley	21 00 to 21 25
Chilled Basic, Pittsburg	21 85 to 22 10

STEEL.—The movement of both Bessemer and open-hearth steel continues limited to small lots as the prices are entirely too high to interest consumers in future deliveries. We have heard of no transactions in Bessemer upon which to base a quotation, but a large lot of 4x4 billets is held at $30, Youngstown, equivalent to $30.85, Pittsburg. Open-hearth billets are commanding from $32 to $32.50 for ordinary specifications, while high carbons are selling as high as $37. Rods command extremely high prices, sales of Bessemer having been made at $36, and of open-hearth at $37. The largest independent interest is entirely sold up for several months and will not take orders for forward delivery.

FERRO-MANGANESE.—Domestic 80 percent is quoted at $50 in carload lots at the furnace. English ferro of the same quality is quoted at $49 in carload lots delivered at buyer's mill.

SPELTER.—The market continues to grow stronger and prices are advancing slightly. We quote prime Western grades in large lots at 4.92½c to 4.95c.

MUCK BAR.—This market continues in a demoralized condition and several mills east of here have shut down entirely rather than dispose of their product at present prices. A number of large lots have been offered consumers during the week at $33 at mill, but they seem to be of the impression that $32.50 is sufficient to pay for this product at this time and as a consequence the trade is in almost a condition of deadlock. Taking the present price of iron into consideration and the high puddling rate, manufacturers say they must secure at least $34 for their product in order to secure any profit. On Feb. 16 the lease on the old Keystone Rolling mill on Second Ave. held by the Fort Pitt Iron & Steel Co for the past two years expires and will not be renewed. Whether the owners of the plant will shut it down entirely and dismantle it has not yet been decided. There is some talk of installing a large amount of new machinery and continuing operation on more modern lines.

SKELP.—The skelp market continues low in sympathy with muck bar, grooved and sheared iron skelp, wide sizes being held at 1.92½c to 1.95c. Steel skelp is held at 1.95c for large sizes and an advance of about 10 cents is asked for the smaller sizes.

RAILS AND TRACK MATERIAL.—Foreign steel rails are now being offered in this market in considerable quantities, the 40-pound rails being held at $37 and the 60-pound at $34. The demand for light rails continues heavy, but mills are in position to make much better shipments than for some time. We quote: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $40; 12 pounds, $37.50 to $38; 16 pounds, $36 to $37; 20 pounds, $35; 25 to 40 pounds, $34 to $34.50. Track materials: Spikes, 2.15c to 2.25c; track bolts, square heads, 2.05c; hexagon heads, 2.65c; fish plates, 1.60c.

PLATES.—Tank manufacturers closed contracts for a large tonnage during the past ten days for delivery during the next six months. Other large plate consuming interests are also buying to a considerable extent and the market continues very firm. Agreed prices follow: Tank plates, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.75c; marine, ordinary, fire-box, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive fire-box, not less than 2.10c, and it ranges in price to 3c. Plate more than 100 inches wide, 5c extra 100 pounds. Plate 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra. These quotations are based on carload lots, with 5c extra a hundred pounds for less than carload lots. Terms, net cash, in 30 days.

BARS.—A number of fairly large contracts for steel bars have been placed this week but jobbers are still holding off. Some of the large trade formerly held by the jobbers is reported to have closed with the mills direct. The demand for iron bars also continues strong. We quote as follows: Bessemer steel bars, 1.60c; open-hearth, 1.70c; plow beams and cultivator beams, 1.60c, net; channels, angles, zees and tees, Bessemer under 3 inches, 1.70c; over 3 inches, 1.80c; bar iron, 1.80c, Youngstown, or 1.84¾c, Pittsburg, with freight added to point of delivery from Youngstown. Hoops and bands are quoted at 1.90c, full extras, in 250-ton lots and over, and 2c in less than 250-ton lots.

STRUCTURAL MATERIAL.—The American Bridge Co. closed contracts during the week calling for fully 8,000 tons of material. Within the next two months contracts will be placed for two bridges to be erected in this district that will require fully 15,000 tons of material. We quote as follows: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles from 3 to 16 inches, 1.60c; universal mill plates, 1.60c.

PIPES AND TUBES.—The independent pipe interests have formed an association for the purpose of maintaining a scale of prices which is said to be slightly lower than those of the National Tube Co. Demand for pipe during the past few days is above the normal for this season of the year and the market is in a very strong condition. Prices on carload lots, plus the freight to destination, are as follows:

MERCHANT PIPE.

	Steel		Guaranteed Wrought Iron	
	Black Percent.	Galv. Percent.	Black Percent.	Galv. Percent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inch	75	65	72	62
7 to 12 inch	73	63	70	60
Plugged and Reamed				
1 to 4 inch	73	63	70	60
Cut 3 to 6 feet				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inch	71	60	68	57
7 to 12 inch	69	57	65	54
Cut 6 feet and longer				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inch	72	61	69	58
7 to 12 inch	70	58	66	55
Extra Strong Plain End				
⅛ to 8 inch	69	59	65	55

Threads only—Same as Plain End, plus 1¼ percent net.
Threads and Couplings—Same as Plain End, plus 2½ percent net.

Double Extra Strong Plain End				
⅛ to 8 inch	61	51	57	47

Threads only—Same as Plain End, plus 2 percent net.
Threads and Couplings—Same as Plain End, plus 3 percent net.

NOTE: Orders for less than carload will be charged at 12½ percent advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 percent net for 6 feet and longer, and 15 percent net for 3 to 6 feet.

BOILER TUBES.

Steel.

	Percent
1 to 1¼ inches	45
2¼ to 5 inches	62½
1¾ to 2¼ and 6 to 13 inches	59¼

Iron.

	Percent.
1 to 1¼ inches	36½
2¼ to 5 inches	45½
1¾ to 2¼ and 6 to 13 inches	55½

CASING.

	S. and S. Percent.
2 to 3 inches	58
3½ to 4 inches	60
4½ to 12½ inches	62

SHEETS.—Galvanized sheets are reported slightly firmer as the result of an increased demand. The demand for black sheets has also improved slightly. Black sheets in 500-bundle lots and over are quoted as follows: No. 28, 2.75c; No. 27, 2.65c; No. 26, 2.55c; Nos. 22 and 24, 2.45c; Nos. 18 and 20, 2.35c; Nos. 14 and 16, 2.25c; Nos. 10 and 12, 2.10c to 2.15c. Galvanized: No. 16, 2.60c; No. 18, 2.85c; No. 26, 3.35c; No. 27, 3.60c; No. 28, 3.85c; No. 29, 4.35c; No. 30, 4.50c.

MERCHANT STEEL.—The demand for shafting of all kinds is much better than it has been for the past three months, large consumers placing contracts freely for their annual requirements. We quote: Turned cold rolled and ground shafting, 47 off in carload lots and 42 percent off in less than carload lots; tire steel, 2.15c to 2.25c; spring steel, 2.25c to 2.35c; toe calk, 2.30c to 2.40c. The following differentials maintain: Less than 2,000 pounds of a size and not less than 1,000 pounds, 10 cents advance; less than 1,000 pounds of a size, 30 cents advance. Tool steel is quoted 7 cents and upwards, according to the grade.

WIRE AND WIRE NAILS.—Current demand continues good and the mills are operating at their utmost capacity to fill orders. We quote: Wire nails, carload lots, to jobbers f. o. b. cars, Pittsburg, $1.90; plain wire, carload lots, $1.80; barb wire, carload lots, $2.20; staples, carload lots, $2.10. Galvanizing, 30 cents extra. Carload lots to retailers are held at 5 cents advance in all lines, and on less than carload lots a further advance of 10 cents is charged. Steel cut nails are quoted as follows: Carload lots, $2.10, and less than carload lots, $2.15 f. o. b. Pittsburg, plus freight to point of destination. Iron cut nails are $2.20 in carload lots and $2.25 in less than carload lots. Terms, 60 days, less 2 percent off in 10 days.

OLD MATERIAL.—The demand for low phosphorus melting stock continues large, but there is not sufficient to be had to supply the demand. Further inquiries are being made for the importation of this material. Our quotations, gross tons, are as follows: Heavy melting stock, $21.50 to $22; low phosphorus melting stock, $25 to $25.50; steel rails, $21 to $21.25, re-rolling rails, No. 1 cast scrap, $18 to $18.50; borings, $11 to $11.50; busheling scrap, $17.50 to $18.50; old iron rails, $24.50 to $25; turnings, $15 to $15.50.

COKE.—The demand for spot coke continues strong and fancy prices continue to rule. On six month contracts foundry coke is selling at $5 to $5.25 and furnace at $4 to $4.25. For the week ending Saturday, Jan. 24, the production of the upper region amounted to 241,786 tons and that of the lower region 49,200 tons, an increase of about 2,000 tons over the previous week.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
519 MONADNOCK BLOCK, Feb. 3.

Finished iron and steel continues to be in chief demand in this market. The pig iron trade remains quiet, sales being of a desultory character and mainly for small lots. The buying of the leading cast iron pipe interest last week has aided in stiffening the market, and there is less disposition than formerly to shade established prices. The coke and car famine, which is without any improvement, also helps in maintaining a firm market. One local furnace is banked and another out of blast for want of fuel, and there is every prospect of more stacks banking soon unless the railroads can do better. Shipments from the South are considerably delayed owing to the traffic blockades and scarcity of cars. Foundries are suffering in the same proportion as furnaces, and many are compelled to enter the open market both for pig iron and fuel in order to keep their shops running. The chief transaction of the week in finished material is the sale of 6,000 tons of domestic Bessemer billets for quick shipment to an Indiana wire mill. Wire rods and German billets have also been in demand, 500 tons of the former and 2,500 tons of the latter having been sold by a local concern during the week. Plates have been active, the total sales aggregating over 15,000 tons. Iron and steel bars are also in excellent demand, many consumers placing contracts for their year's requirements. The total specifications for one day of two of the leading producers of these products exceeded 10,000 tons, from which may be judged the activity of this branch of the trade in this market. The sales of structural steel during the week under review have been mainly for lots below 500 tons, though the aggregate tonnage is large. Specifications, however, are very heavy. There is no diminution in the demand for wire nails and fencing. Sheets, rails and merchant steel are quiet. Boiler tubes and merchant pipe are moving briskly, boiler makers, pump manufacturers and jobbers still placing good sized contracts. Reports are current that independent mills are shading established prices on pipe about 5 percent on both steel and wrought iron. The scrap market is without interest, trading being limited to such lots and grades as mills are compelled to buy. One leading producer announces that it has withdrawn from the market on billets, sheet bars and plates. It is practically out of the market also on rails, since it can only give late deliveries, and it is also sold up for several weeks on certain sizes of structural material.

PIG IRON.—This market is without appreciable change. From a selling standpoint it has been very quiet. Some sales were made, but nothing over 500 tons. The bulk of the business transacted was in carload lots, with a sprinkling of 200, 300, and 500 ton lots. Inquiries, however, have been considerably better, indicating that melters are becoming a little restless over the situation. Tributary influences are bringing this about. The scarcity of cars in the South and the heavy volume of traffic on all railroads in that section has decreased shipments from Southern furnaces. Two local stacks are without coke, and a majority of those in blast have such a small supply on hand that they are without assurance as to how long they can continue in operation. Several large buyers have also been sounding the market for future needs, one concern placing orders for 15,500 tons of Nos. 2 and 3 foundry and No. 2 soft, as mentioned in last week's issue. The demand for spot iron is increasing, and foundrymen compelled to enter the open market have experienced difficulty in obtaining it. All these conditions have aided in keeping the market on a firm basis. Most sellers believe that the bottom has been reached, and that the day of $18 iron has passed, at least, for this year. To the firmness of all other markets they point for proof of this fact. Local sellers are still quoting on the basis of $18.50, and it is not doubted that some would accept $18 for No. 2 on a desirable order. There is a good inquiry for charcoal iron, malleable Bessemer and high silicon irons. Coke grades are also in good demand for spot shipment, and $19 Birmingham for No. 2 and $24 Chicago for the same grade of Northern iron are the minimum quotations. Standard Bessemer for quick delivery is offered at $24.30 to $24.50. Foreign iron, No. 2 Foundry, $25. Among the inquiries received during the week was one for 1,000 tons of No. 2 foundry, for delivery in the second and third quarters; another for 1,000 tons of No. 2 foundry, 1,000 tons of malleable Bessemer, and 200 tons of silvery iron, 8 percent to 10 percent silicon, for delivery in the first half, and several lots of smaller tonnages. We quote as follows, the maximum price being for first half:

Lake Superior Charcoal	$26 50 to 27 50
Local Coke Foundry No. 1	23 50 to 24 50
Local Coke Foundry No. 2	23 00 to 24 00
Local Coke Foundry No. 3	23 50 to 23 50
Local Scotch Foundry No. 1	24 00 to 24 50
Southern Coke No. 1	22 85 to 23 35
Southern Coke No. 2	22 35 to 22 85
Southern Coke No. 3	21 85 to 22 35
Southern Coke No. 4	21 35 to 21 85
Southern No. 1, soft	22 85 to 23 35
Southern No. 2 soft	22 35 to 22 85
Southern Gray Forge	21 35 to 21 85
Southern Silveries (according to silicon)	26 15 to 28 15
Jackson Co. Silveries, 6 to 8 percent silicon	23 20 to 23 20
Ohio Strong Softeners	26 30 to 26 80
Alabama and Georgia Car Wheel	27 35 to 28 35
Malleable Bessemer	23 50 to 24 50
Standard Bessemer	24 00 to 24 50

BARS.—There is no let-up in the buying of iron and steel bars, which have been very heavy since the first of the year.

Contracts of 1,000 tons and greater are numerous, all branches of the consuming trade covering for their requirements, in some instances, for the entire year, and others for six months. Specifications are also very heavy, 5,000 tons for one day being not uncommon. Prices of iron are stiffening with an upward tendency. We quote mill shipments, Chicago delivery, Bessemer steel, 1.76½c; angles, less than 3x3, 1.86½c base; hoops, in lots of 250 tons and greater, 2.06½c base; less than this amount, 2.16½c; iron, 1.81½c to 1.86½c. Store prices are as follows: Steel, 2c to 2.10c; iron, 2.15c to 2.20c; hoops, 2.40c to 2.50c; angles, 2.25c to 2.50c rates.

Sheets.—Of all grades of finished material, sheets are probably in least demand, which is attributed to the fact that the buying season is still some weeks ahead. Local sellers report mill sales quiet during the week under review, though the movement from warehouse stocks has been brisk. We quote No. 27 black, 2.76½ to 2.81½c; galvanized, 3.35c to 3.45c. For deliveries from stock, No. 27 black, 2.95c to 3c; galvanized, 70 and 7 to 75 and 7½ percent, or 3.70c to 3.80c net.

Structural Steel.—While specifications have been voluminous, new business has not been of large proportions. Orders that have been booked were largely for lots below 500 tons, though, as these have been plentiful, the aggregate tonnage is large. We quote mill prices, Chicago delivery: Beams, 15 inches and under, 1.75c to 2c: 18 inches and over, 1.85c to 2.10c: universal plates, 1.75c to 2c; angles, channels and tees, 1.85c to 2c base. The maximum quotation is asked by some mills for quick delivery. On lots from store, cut to length, we quote 2¼c to 2½c per pound.

Plates.—Mills have taken a large tonnage during the week under review, the total amount exceeding 15,000 tons. This is made up of orders from consumers all over the country and includes some large lots. We quote mill shipments, Chicago delivery, as follows: Tank steel, ¼-inch and heavier, 1.75c to 1.95c base; flange steel, 1.85c to 2c base. Prices from stock, tank steel, ¼-inch and heavier, 2.25c to 2.35c; 3-16, 2.25c to 2.40c; Nos. 8 and 10, 2.40c to 2.50c; flange steel, 2.50c to 2.60c.

Rails and Track Supplies.—Several small orders for both heavy and light rails have been placed with mills, though the tonnage is not large. Track supplies are in good demand. We quote heavy sections, $28; second quality, $27; light rails, 45 pounds, $34 to $35; 12 pounds, $40 to $41, with regular differentials for intermediate sizes. Track supplies, mill shipments, are quoted as follows: Angle bars, 2c to 2.10c; spikes, first quality, 2.25c (out of store, 2.40c to 2.50c rates); second quality, 2:15c; track bolts, 3½x¾ with square nuts, 2.85c to 3c per 100 pounds; with hexagon nuts, 3.05c to 3.15c, with usual differentials for other sizes.

Merchant Steel.—A larger tonnage of new business has been placed with mills than for several weeks. However, owing to the crowded condition of producers, this is necessarily small. Specifications continue very heavy, in many cases exceeding stipulated quotas. We quote mill shipments, Chicago delivery, as follows: Spring steel, 2.65c to 2.75c; sleigh shoe, 1.95c, flat sizes; concave and convex, 2c; out of store, 2.15c; cutter shoe, 2:50 to 2.60c; machinery steel, 2.15c to 2.25c base; plow steel, 2.50c and upwards, according to quality; toe calk, 2.30c to 2.40c; out of stock, 3c to 3.10c; ordinary tool steel, 6c to 7c; specials, 13 cents and upwards; less than carload lots, 5 to 10 percent higher; cold rolled shafting, carload lots, 47 percent off; less than carload lots, 42 percent off.

Merchant Pipe.—Pump manufacturers and jobbers have been heavy buyers during the week. Independent mills are reported to be cutting prices on steel and wrought iron pipe 5 percent. We quote prices to consumers, mill shipments, carload lots, random lengths, f. o. b. Chicago, as follows:

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ⅜ in inclusive	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches, inclusive	73.35	63.35	70.35	60.35
7 to 12 inches, inclusive	71.35	61.35	68.35	58.35

Less than carload lots, 12½ percent advance over above prices.

Boiler Tubes.—There is no diminution in the demand and prices are without change. We give below quotations for carload lots, mill shipments, f. o. b. Chicago. Less than carload lots from mill, 12½ percent is to be added:

	L. W. Steel Percent.	C. C. Iron Percent.
⅛, ¼, ⅜ in	66½ net	56½ net
½ in.	68½ net	58½ net
2¾ to 5 in	60.85	45.85
6 to 13 in	55.85	35.85

For lots direct from warehouse stock:

	L. W. Steel Percent.	C. C. Iron Percent.
1 to 1½ in	35	25
1¾ to 2½ in	47½	32½
2¾ to 5 in	55	42½
6 to 13 in	47½	32½

Cast Iron Pipe.—Demand is quiet, being limited to the usual run of orders received in the day's mail. We quote f. o. b. Chicago, 4-inch water pipe, $34; 6-inch, $33; 8-inch and upwards, $32; gas pipe, $1 a ton higher.

Billets and Wire Rods.—Sales have been made during the week of 6,000 tons of domestic Bessemer billets to a wire mill, of 2,500 tons of German Basic Bessemer billets to an Eastern manufacturer, and of 500 tons of wire rods to an Indiana mill. The price of the latter was $36, Pittsburg. We quote Chicago delivery, wire rods, $37.50; Bessemer billets, $31.50; small lots from stock, 4x4, $40; open hearth billets for forging purposes, $36 to $38; for use in rolling mills, $32.50 to $33. German basic Bessemer billets, Chicago delivery, $31.50 to $32. Special carbons are higher.

Wire Nails and Fencing.—The market keeps up its past activity, both retailers and jobbers placing large orders. There is every indication that the spring trade this year will be heavier than for many years past. This is accounted for by the larger orders that are being placed for wire nails and fencing of all kinds by dealers in all parts of the country. We quote prices to jobbers, Chicago delivery, as follows: Plain wire, carloads, $2; smaller lots, $2.10; galvanized, $2.30 in carloads, and $2.40 smaller lots. Barb wire is $2.40 in carloads, and $2.50 in less than carloads; galvanized, $2.70 in carloads, and $2.80 in lesser lots. Staples are $2.20 carloads, and $2.35 smaller lots. Wire nails, $2.10 carloads, and $2.20 smaller quantities; cut nails, $2.10 to $2.15 carloads, and $2.20 to $2.25 less than carload lots. Poultry netting to jobbers, 85 and 5 percent discount from list f. o. b. Joliet or DeKalb, with actual freight allowed, not exceeding 50 cents per 100 pounds; to retailers 80 and 20 percent off.

Coke.—Considerable uneasiness is felt by furnacemen and foundrymen over the local outlook. Shipments into the city seem to diminish every week, and consumers are forced into the open market to secure a sufficient supply to keep their furnaces and cupolas in operation until railroads can move cars more quickly. There is a large amount of coke on track at points 10 to 20 miles outside of Chicago, but the railroads have neither the locomotives nor the trackage facilities to bring it into the city. Spot coke is selling at $10 to $10.50. Little new business is being booked, as the outlook is so discouraging that sellers are refusing to obligate themselves further. However, we quote Connellsville coke at ovens, $5 to $5.25.

Old Material.—The market is without material change. Mills consider prices too high and will not buy. There is some demand for special lots, but the aggregate tonnage is not large. We quote as follows, gross tons:

Old iron rails	$23 50 to 24 00
Old steel rails (mixed lengths)	18 00 to 18 50
Old steel rails (long lengths)	23 00 to 23 50
Relaying rails	31 50 to 32 00
Old wheels	23 00 to 23 50
Heavy melting steel	17 50 to 18 00
Mixed country steel	15 00 to 15 50

The following are selling prices per net ton:

No. 1 R. R. wrought	$19 50 to 20 00
No. 2 R. R. wrought	18 00 to 18 50
Shafting	19 00 to 19 50
Dealers' forge No. 1	16 50 to 17 00
No. 1 busheling and wrought pipe	14 00 to 14 50
No. 1 cast	16 50 to 17 00
Railway malleable	15 50 to 16 00
Country malleable	14 50 to 15 00
Iron axles	23 50 to 24 00
Steel axles	19 50 to 20 00
Cast borings	10 00 to 10 50
Mixed borings, etc	9 50 to 10 00
Wrought turnings	13 50 to 14 00
Machine shop turnings	13 00 to 13 50
Iron axle turnings	14 00 to 14 50
Steel axle turnings	13 50 to 14 00
Stove plate and light cast scrap	12 50 to 13 00
Old iron splice bars	21 00 to 21 50

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Feb. 4.

As a preliminary to deciding upon the prices of ore for the year, elaborate statistics concerning production and consumption have been compiled. It is estimated that the capacity of the furnaces which will use Lake Superior ores, including those of the Michipicoten district, in the year beginning May 1, 1903, will call for 30,000,000 tons of ore, if operated steadily through the year. This includes estimated requirements of 5,000,000 tons to be used by new furnaces which will be blown in during the year. As this total is more than 2,000,000 tons in excess of the shipments of 1902 from the mines, it is held by those favoring an advance of prices that the supply will not be greater than the demand. The estimated production of old-range Bessemer ores for 1903 is rather less than the actual output for 1902, and in the case of Mesabi ores estimates of what the mines can do in the way of output this year show that any increase over 1902 must come from the mines that made their first shipments last season. It is not expected that sales for 1903 will be made before the middle or latter part of this month. In view of the large advance in the prices of pig iron and of coke in the past year, ore men argue that an advance in ore is fully warranted. Mining costs have advanced in line with other things, and while the large mines have made good profits the properties of smaller outputs have not fared so well. Mesabi producers are quite of one mind in moving for a higher price this year, 50 cents and as high as 75 cents being talked of. On old range ores 25 and 50-cent advances are proposed by some sellers; but supply and probable demand will be well canvassed before definite decisions are reached. Ore is now moving rather slowly from docks to furnaces, but this is attributed to the inability of railroads to do the hauling.

COKE.—Delivery is very slow. Cars loaded in the Connellsville region in December have not yet arrived in Cleveland. Such delay is exceptional, but it is not uncommon for cars to be two weeks in making the trip. No foundries have recently been compelled to stop on account of coke shortage, but many of them have had barely enough to keep going. Prices are $8 for spot and $5.75 for the first half of 1903.

PIG IRON.—Furnacemen, most of whom have disposed of nearly all of their expected output for the first half, are not disposed to press sales agents to make contracts for the second half. The uncertainty as to the price of ore probably causes some hesitation in fixing prices. On the other hand, buyers are very hopeful that prices will be lower and are not disposed to make contracts for the second half. Consequently, business is limited to a large extent to sales to meet immediate requirements. Spot iron is a little easier, some sales of Northern having been made at $23.35, Cleveland, for No. 2, while other sales were on a basis of $24.50 for No. 2, the latter being Southern Ohio iron. For delivery in April, May and June, sales are being made at $22.85 for No. 2 Northern. Lake Superior charcoal, for delivery in the last half, commands $24 to $25, Cleveland. A considerable quantity of mottled iron has been offered within a few days, but has not been sold. The strike of the limestone workers in the Youngstown district may compel several furnaces to bank before the close of the week. We quote as follows, f. o. b. Cleveland, for shipments in the first half of 1903:

Bessemer	$21 85 to 22 35
No. 1 Strong Foundry	23 00 to 23 50
No. 2 Strong Foundry	22 50 to 23 00
No. 3 Foundry	21 75 to 22 25
Scotch No. 1	23 00 to 23 50
Scotch No. 2	22 50 to 23 00
Gray Forge, Valley	20 00 to 20 25
Lake Superior charcoal	26 50 to 27 50

FINISHED MATERIAL.—The effort of the railroads to relieve the coal situation, for which the demand was imperative, has resulted in unprecedented delays in delivering finished material. Cleveland consumers of bar iron are pleased with the change of base from Pittsburg to Youngstown in fixing the price of bar iron, as it puts them on equality with the bolt makers and other consumers of Pittsburg, but the higher price, 1.84¾c, Cleveland, causes them to hesitate, as they doubt if the price will be maintained. There is the competition of smaller mills to consider, but the product of the latter is not large nor is it varied in sizes. Business in steel bars is good. We note one sale of 2,000 tons. The price is 1.60c for Bessemer and 1.70c for open-hearth, Pittsburg, with no concessions for large buyers. Jobbers have been trying to get a lower price, claiming that they can make little, if any, money by selling steel out of store when they are compelled to pay the mill as much as the man who buys a single carload. Agreement quotations on structural material are as follows: Beams and channels, 3 to 15 inches, 1.70c; 18 to 24 inches, 1.80c; tees, 1.75c; zees, 1.70c; angles from 3 to 6 inches, 1.70c; universal mill plates, 1.70c. Excepting plates, the mills could give prompt delivery if the railroads were able to do their part. The sheet situation is unchanged. The prices of the distributors of the product of the principal producer, are as follows: For 3-16-inch sheets and heavier, 2.15c, Cleveland. Mill sales of black sheets, Cleveland, to consumers: No. 24, 2.65c to 2.75c; No. 26, 2.75c to 2.85c; No. 27, 2.85c to 2.95c; and the following prices out of stock: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.50c to 2.60c; No. 16, 2.55c to 2.70c; Nos. 18-20, 2.75c to 2.90c; Nos. 22-24, 2.85c to 3c; Nos. 25-26, 2.95c to 3.10c; No. 27, 3.05c to 3.20c; No. 28, 3.15c to 3.30c. On galvanized sheets we quote mill sales in carload lots, Cleveland, as follows: Nos. 10 and 11, 2.60c; Nos. 12-14, 2.70c to 2.85c; Nos. 18-21, 3c to 3.15c; Nos. 22-24, 3.30c to 3.45c; Nos. 25-26, 3.55c to 3.70c; No. 27, 3.80c to 3.95c; No. 28, 4.05c to 4.20c; No. 29, 4.45c to 4.60c; No. 30, 4.95c to 5.10c. Galvanized sheets out of stock are quoted at 75 and 2½ off.

OLD MATERIAL.—The advance in the price of bar iron has not yet benefited the scrap dealers as was expected and the market is quiet. Prices are firm. We quote Cleveland prices, all gross tons, as follows:

Old iron rails	$24 00 to 24 50
Old steel rails (over 6 feet)	22 00 to 23 00
Old steel rails (6 feet and under)	21 00 to 22 00
Old car wheels	23 00 to 24 00
No. 1 R. R. wrought scrap	20 00 to 21 00
Mill scrap	19 00 to 19 50
No. 1 machine cast scrap	21 00 to 21 50
Iron axles	29 00 to 30 00
Steel axles	28 00 to 29 00
Axle turnings	18 00 to 19 00
Wrought turnings (free from cast)	16 00 to 17 00
Cast borings	11 00 to 12 00
Uncut wrought iron boilers	12 00 to 13 00
Steel boiler plates	17 00 to 18 00
Grate bars	12 00 to 13 00
Pipes and flues (clean)	17 50 to 18 50
Tank iron	17 00 to 18 00
Hoop and band iron	13 50 to 14 50
Sheet iron	12 00 to 13 00
Wrought drillings	15 50 to 16 50
Malleable iron (railroad)	20 50 to 21 50
Malleable iron (agricultural)	17 50 to 18 00
Stove plate	16 00 to 17 00
Heavy steel	19 00 to 19 50

NEW YORK.

OFFICE OF *The Iron Trade Review*,
ROOM 1909, NO. 150 NASSAU ST., Feb. 3.

PIG IRON.—The pig iron market in general in this vicinity has not undergone any particular change since our last report. The deadlock between buyers and sellers, has only abated to the extent that some of the former, being unable to obtain any concessions from producers, have invaded foreign centers for their supplies. As a result, we are able to chronicle a little more activity in foreign irons than has been possible for several weeks past. The sales consummated consist of a cargo lot of English hematite at $20 per ton, New York delivery, duty paid, and 5,000 tons of Middlesboro No. 3, at $17.75, under the same conditions. Representatives of foreign furnaces here report that inquiries during the week showed a marked increase, with Middlesboro No. 3 and German irons figuring largely in them. While cargo lots of the former are selling at $17.75 for delivery ex-ship, duty paid, at this port, this price obtains only where extremely favorable conditions prevail, and we know of negotiations now under way, which will conclude with sales nearer $18. German irons are a trifle stronger than since our last writing, and now rule at $20.25 to $20.50, for delivery at this port, ex-ship, duty paid, with some good sales likely to be announced shortly. Scotch irons are only in fair request, and a serviceable grade of No. 1 is easily obtainable at $21, or perhaps a little higher.

For the time being, domestic irons cut little figure in this market. Even where there is a disposition to buy, the scarcity of material on one hand, and the high prices demanded on the other, make sales few and far between, and only then where a pressing want has to be met. Reports from foundry centers

still make the inability to secure coke the all-absorbing topic, and the foundry that is running up to its full capacity is counted fortunate. During the week, considerable talk was heard about foundrymen contemplating increasing the price of castings. We quote: No. 1 X Northern, $23.25 to $24.25; No. 2 X, $22 to $22.75; No. 2 plain, $21 to $21.75; Southern No. 1 foundry, $23 to $23.50; No. 2 foundry, $22 to $22.50; No. 3 foundry, $21.50 to $22; No. 4 foundry, $20.50 to $21.

BILLETS.—Without change. German Bessemer basic and open-hearth billets selling in cargo lots, New York delivery, duty paid, at $28 and $29 respectively.

FINISHED IRON AND STEEL.—The feature of the week has been the entrance into the structural material market of railroads, desirous of providing for some of their wants for the current year. While the sales made have been large, the inquiries made indicate the placing of some extremely heavy orders before many weeks elapse. Contracts closed during the week by the American Bridge Co., include 6,500 tons for the Louisville & Nashville Railroad Co., for structural and bridge purposes; 5,000 tons for the Southern Railroad Co., and 1,000 tons for the Boston & Maine Railroad Co., for bridge work; 2,000 tons, for a new office building in St. Louis, and 1,500 tons for the new works of Henry R. Worthington, at Harrison, N. J., in addition to the 5,000 tons mentioned in our last report. The company also received more small orders during the past week, than since the new year opened, and reports that the present and prospective condition of its business, greatly exceeds that which it could note this time a year ago. The plate situation admits of the most rosy report that could be made. On the whole, the feeling in sheets is a little better. In bars, prices are marked by a firmer undertone, small quantities from store being particularly strong, at from 2.15c to 2.30c. New York prices are as follows: Beams and channels, 15 inches and under, 1.75c to 1.90c; angles, 3 to 6 inches, 1,75c to 1.90c; zees, 1.75c to 1.90c; bulb angles, 2.05c to 2.35c; deck beams, 2.05c to 2.25c; sheared steel plates, tank, 2.10c to 2.15c; flange, 2.25c to 2.30c; fire box, 2.30c to 2.50c; refined iron bars, 1.95c to 2c; soft steel bars, 1.95c to 2.10c; steel sheets, in carloads, New York, No. 28 black, 3.05c to 3.10c; galvanized, 75 and 7½ off.

CINCINNATI.

Feb. 3.

There is a prospect of an advance in freight rates from points south of the Ohio River of 50c per ton on pig iron, to become effective March 15. The trade here regard this as unwarranted at this time, as Southern furnaces are now unable to compete with Northern furnaces in some territory and such an advance in rates would throw the burden upon the Southern furnaces instead of upon the buyer. The movement of both pig iron and coke is distressingly slow and foundries and furnaces are both suffering for raw material. Hundreds of carloads of pig iron are on the ground on the south side of the Ohio River waiting for cars from Northern roads. The Southern roads will not allow their cars to go north of the river. The coke market has been a little quieter this week. Spot foundry coke is quotable at $7 f. o. b. ovens. For contracts running into the six months $5.50 to $6 f. o. b ovens about represents the market.

PIG IRON.—The past week has brought no change in market conditions. Buying has been exceedingly light and orders are still confined to small lots of spot or quick shipment iron. There is some inquiry for deliveries in the second and third quarter of the year but the buyers are still maintaining a waiting policy. For No. 2 foundry the general market is $18.50 to $18.75 Birmingham. There have been some sales at lower prices to compete with Northern irons, but anything below $18.50 Birmingham for quick delivery is exceptional. The gray forge market is less interesting, as Southern furnaces refuse to quote less than $17 Birmingham, while some ask $17.50. Buyers claim that they can not pay over $16. The buyers are said to be using scrap in place of forge iron as far as possible, and there is an opinion among selling firms that furnaces are holding the price of forge iron too high. In the face of the dullness prevailing the market maintains a steady appearance. The demand for basic iron has been good and several round lots have been placed. Northern furnaces are becoming more of a factor in this territory. Sales agents for Southern irons attribute the loss of a considerable part of their orders this week to the prices made by Northern furnaces. With the Eastern market influenced by imported iron and the Eastern and Northern Ohio territory using largely local irons, the Southern furnaces are compelled to look for buyers in territory between Central Ohio and the Mississippi river including Michigan, and in the latter described zone the demand seems to be small and buyers much inclined to wait. Still there is enough inquiry, although yet without resultant business, to stimulate the feeling that demand will improve in time to prevent any depressing accumulation of iron in furnace yards. In the meantime there is a slight accumulation now at some of the furnaces and occasionally a sale is made below schedule prices, but actual orders are generally for such small quantities that prices are not readily shaded. We quote for quick delivery and first quarter of 1902, f. o. b. Cincinnati:

Southern Foundry No. 1	$22 50 to 23 00
Southern Foundry No. 2	21 75 to 22 25
Southern Foundry No. 3	20 75 to 21 25
Southern Foundry No. 4	19 75 to 20 75
Southern Foundry No. 1, soft	22 50 to 23 50
Southern Foundry No. 2, soft	21 75 to 22 25
Gray Forge	19 75 to 20 75
Northern Foundry No. 1	22 00 to 23 00
Northern Foundry No. 2	21 00 to 22 00
Southern car wheel iron	27 75 to 28 75

FINISHED MATERIAL—The demand this week shows improvement and a stronger tone prevails. In the light lines buyers appear to have more confidence in the maintenance of prices and are ordering larger lots and more orders are coming in than for some time. The bar iron market has steadied considerably and the car load base price is advanced 5c and the quotation about represents the inside figure as the leading interests are maintaining much higher quotations. We quote black sheets No. 27 at 2.75c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 3.20c; No. 27, 3.10c; No. 16, 2.75c; No. 14, 2.65; No. 12, 2.55c; No. 10, 2.45c. Galvanized sheets, car lots, sell at 75 and 10 percent off; less than car lots, 70 and 10 percent off. Tank plates out of store are quoted at 2.25c for ¼-inch and 2.35c for 3-16-inch. Prices for bar iron in carload lots are: 1.85c base, half extras f. o. b. Cincinnati; steel bars, 1.72c base, half extras f. o. b. Cincinnati. Both are retailed at 2c base, half extras, out of store. Beams and channels are quoted at 2¼c to 2¾c, from stock, and angles at 2.15c to 2.25c for base sizes. The merchant pipe business is active but independent mills are still underselling the leading interests and are taking a good share of the orders for wrought iron pipe. On steel pipe prices are maintained, but recent demand here has been largely for iron pipe. Merchant pipe and boiler types are quoted as follows for carload lots f. o. b. Cincinnati:

MERCHANT PIPE.
(Basing discounts.)

	Steel Pipe. Black. Percent.	Steel Pipe. Galv. Percent.	Guaranteed Wrought Iron Pipe. Black. Percent.	Guaranteed Wrought Iron Pipe. Galv. Percent.
⅛, ¼, ⅜-inch	66.8	56.8	68.8	58.8
½-inch	68.8	58.8	65.8	55.8
¾ to 6-inch, inclusive	73.8	63.8	70.8	60.8
7 to 12-inch, inclusive	71.8	61.8	68.8	58.8

BOILER TUBES.

	Steel Percent.	Iron Percent.
1 to 1½ in	43.8 & 5	38.8 & 5
1¾ to 2½ in	56.3 & 5	36.3 & 5
2¾ to 5 in	61.3 & 5	46.3 & 5
6 to 13 in	56.3 & 5	36.3 & 5

OLD MATERIAL—The market is active and steady with no change in prices. There is a good demand and sales were larger than last week. We quote:

Old No. 1 wrought railroad, net tons	$19 50 to 20 00
Cast machine and foundry, net tons	16 50 to 17 00
Old iron rails, gross tons	22 50 to 23 00
Old steel rails, gross tons	21 50 to 22 00
Old short lengths, gross tons	17 50 to 18 00
Old iron axles, net tons	26 00 to 27 00
Old chilled car wheels, gross tons	21 50 to 22 00
Stove plate, net tons	11 50 to 12 00
Wrought turnings, net tons	15 00 to 15 50
Cast borings, net tons	12 00 to 12 50

BIRMINGHAM, ALA.

Feb. 3.

The question of chief concern to iron manufacturers in the South just now is that of freight rates. There is a

strong probability of a further advance of 50 cents a ton to Ohio River points, making the total advance $1, or an increase of 40 percent. This, together with the advance north of the Ohio river it is feared will prove quite a burden to the Southern furnacemen. It is claimed that although present prices of pig iron seem very remunerative, they cannot be expected always to prevail, and when a lower level of prices comes the high freight rates will be very burdensome. The great bulk of Southern iron produced goes to the North, and of course any addition in freight charges is equivalent to that much increase in the cost of the manufacture. Present rates are only protected to March 15.

The Standard Steel Car Co., which recently purchased the Southern Car & Foundry Co., plans to make considerable expenditures in enlarging and improving the Anniston plant. The explosion of a boiler at this plant the past week resulted in the death of half a dozen men, while several others were injured.

J. A. Blount, president and general manager of the Gadsden Car, Foundry & Machine Co., states that his company expects at once to increase its capital stock from $25,000 to $50,000, adding a mill supply and boiler making department.

The recent purchasers of the plow factory at Ensley are planning the erection of a new shop 100x117 feet. They expect to manufacture beams, and probably a line of general agricultural implements. Heretofore the work of this plant has been confined to the manufacture of plows.

That section of Alabama being opened up by the Eastern Railway of Alabama (running from Talladega to Ashland in Clay County) is attracting considerable interest from capitalists. Several companies have been organized to investigate the graphite deposits in that section; brown ore mines are being developed, and considerable lumber is being turned out from the mills. Gold mining is being continued also on a considerable scale, although the results have not always proven very satisfactory, owing to the pecularity of these auriferous deposits. It is reported that the Idaho Gold Mining Co., organized by New York and Boston capitalists, will make thorough explorations and tests of this field.

The Metal Market.

NEW YORK.

OFFICE OF *The Iron Trade Review*, Room 1909, No. 150 NASSAU ST., Feb. 3.

PIG TIN.—The manipulators who have been bulling the pig tin market recently were forced to abandon their operations during the past week, in consequence of the depressing factors which made their appearance, and which have brought about a decline in values of some 75 points, within a week. The first setback came as a result of the Banca sale last Thursday, which commanded prices equivalent to 29¾c here, but which was followed by a decline of ½ cent in the same locality. Then shipments from the Straits were 4,740 tons, which was about 700 tons more than expected. Following this came the announcement that the visible American supply was over 8,000 tons, the heaviest on record. Even Australian shipments during January increased 40 percent. Finally, all reports showed the demand from all sources to be exceptionally poor. With these adverse features prevailing, it was thought only natural that closing prices today should be the lowest for the week. In London, the market declined in sympathy with here, in consequence of what has been said, spot being some £3 lower than our last report. Closing prices at the Metal Exchange today were as follows: Spot, to February, 28.30c to 28.60c; March to May, 28¼c to 28.65c. London's closings today follow: Spot, £129 15s; futures, £130 7s 6d. Arrivals at Atlantic ports for the month to date amount to 955 tons, with 3,800 tons afloat.

COPPER.—Under the influence of manipulation, the leading factors in which are known to have Wall Street connections, copper values were a little firmer during the week. Wall Street reports of the general trade situation still continue to be widely at variance with those promulgated in copper circles, the former being as bullish as the latter are undoubtedly bearish. In and of itself the condition described is regarded as not auguring well for a healthy trade. The London market during the week has been dull and weak. Closing prices today at the Metal Exchange were as follows: Lake, 12½c to 12¾c; electrolytic, 12½c to 12.70c; casting, 12¼c to 12½c (it is freely offered at 12⅜c); standard, 12c nominal. The copper exports for January amounted to 10,201 tons, against 15,474 tons for a similar period last year.

PIG LEAD.—Unchanged here, at 4.12½ cents for lots of 50 tons or more. In St. Louis, the standard price for the same quantity has been reduced by the leading interest from 4.05c to 4c. London is a trifle lower at £11 6s 3d.

SPELTER.—Values are a shade higher, being quoted now at 4.95c to 5c. In St. Louis, the prevailing price is 4.85c. London is stronger at £20 7s 6d.

ANTIMONY.—The market is without change, Cookson's being 8½c to 8¾c; Hallett's, 7c to 7¼c; and other brands, 6¾c to 7c.

NICKEL.—Large lots can be had at from 40c to 50c, and smaller lots at from 50c to 60c.

QUICKSILVER.—Jobbers only are in the market, and sales have been made on the basis of $48 per flask in lots of 100 flasks. London, £8 15s.

Pittsburg Open to the Wabash Road at Last.

(Special Telegram.)

Pittsburg, Feb. 4.—The ordinance granting the Wabash Road entrance into the city has been signed by Recorder Brown. Work on bridges and depots will be resumed immediately and the first train will come into the city no later than next September. The entrance of this road will greatly aid shippers in this district and will do much towards relieving the freight congestion from which Pittsburg has been suffering, and particularly in the past year.

No Concessions to Large Buyers of Bars.

(Special Telegram.)

Pittsburg, Feb. 4.—A meeting of the steel bar manufacturers' association was held here yesterday at the Duquesne Club at which the question of a differential price to large buyers was considered. The impression has obtained to some extent in the trade that a concession from the base price would be allowed. The manufacturers very thoroughly canvassed the conditions and concluded that in view of the increased cost of production and the fact that bars have been maintained at a fair level they would not be justified in making any concessions from the present base price of 1.60c for Bessemer steel f. o. b. Pittsburg and that rate was affirmed. While large consumers were demanding a concession the large jobbers that have been selling to consumers requiring from 100 to 1,000 tons annually, were most active in their demands for a slight concession to enable them to handle this trade at a slight profit. Since no concession has been granted it will be impossible for them to continue looking after this trade and all but the smallest consumers will be compelled to purchase from the mill direct.

Contracts for Foundry and Sheet Mills in Europe.

F. R. Phillips & Sons Co., of Philadelphia and Pittsburg, has secured the contract for the engineering and equipment of a large modern foundry in Europe, to be built on American lines throughout. It will be used for the manufacture of heavy machinery, chilled rolls, etc., and will include the most recent and improved appliances in use in the United States. The company has also been awarded a contract for a large foreign sheet mill plant, with open-hearth furnaces, gas producers, sheet mills, bar mills, heating furnaces, shears, lathes, engines, boilers, electrical equipment, etc. This plant also will be constructed entirely according to American practice and will include the most advanced machinery used in this country today. A large part of the equipment will be built in the United States and as in the case of the Italian tin plate mills which this company is just about completing, American workmen will be sent over to start up the plants and operate them.

The foundry and machine shops of Uline Bros., Ballston, N. Y., were destroyed by fire Feb. 2. The loss is $10,000.

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THE STEEL CORPORATION AND ITS ASSETS IN ORE.

If the United States Steel Corporation had really meant no more than the public thought at the time it was formed, a consolidation effected mainly to prevent a titanic struggle between diverse interests desperately striving to protect what they already had at stake with costly duplication of plant, the two years that have elapsed would have fully sufficed to show it up as a failure. There has been outside competition in an aggressive form; the corporation has been deprived of the services of a number of its good men who were thought to be important factors in its success; and its enormous earnings have not influenced the public to rate its securities at what those earnings in an ordinary case would indicate. When President Schwab stated before the Industrial Commission shortly after the corporation had actually been put in operation that the Lake Superior ores would only last possibly 60 years, and Connellsville coking coal 30 years, the daily press and general public, outside the steel trade, construed this as a bear argument on the securities, a considerable part of the tangible assets against which were to be exhausted in what appeared to be such a short time.

A period of less than two years has opened the eyes of the general public, and even of the steel trade, to facts which were not grasped when the corporation was formed. The most active prospecting has brought forth comparatively little additional ore in sight in the Lake Superior region. Properties that were regarded as almost valueless a few years ago bring fabulous prices. The line has been more sharply defined than ever between the cost of making iron from Lake Superior ore and from other ore which is found in various places. With the very high prices which Northern pig iron commands, say at Pittsburg, Alabama has been less able to ship into that district than in the period of low costs, although the then freight rate on Southern iron to Pittsburg was a much larger percentage of the delivered price than it is today. The difference in cost between making iron with rich and with lean ores has been greatly increased. The comparative cost of fuel, for example, as between a ton of coke for Lake ore and from one and a half to two and a half for other ores, has been greatly increased by much higher prices which are freely paid for Connellsville and nearby coke. Independent finishing mills, built to realize the profits apparently made necessary by the large capitalization of the corporation have met a market which gives them no margin and which admittedly has driven many of them to the absolute necessity of getting raw materials of their own or giving up the fight.

These facts have emphasized the importance of the corporation's control of certain raw materials to an extent which was not anticipated. There has been no such marked advance in the value of ore lands in general. A single company in Alabama, to which we apply figures coming from a recognized authority on Alabama ores, has altogether more ore than double the whole known reserves in the Lake Superior region, and mining that portion of the vein which it is now doing, can take out more than those reserves. Yet this ore is still valued at but a few cents a ton in the ground.

In view of the forthcoming annual report of the corporation a study of its operations in the light of prior reports is of value. In the first fiscal period, the nine months ended Dec. 31, 1901, the corporation set aside at the rate of 2-3 of 1 percent a year as a sinking fund against the $304,000,000 5 percent bonds. This amount annually, invested at 4 percent—and the corporation can do better by buying either bonds or preferred stock at par—would retire the issue in 50 years. The 5 percent interest on these bonds, plus the 2-3 percent for the annual sinking fund, amounts to $17,320,000. This is slightly over a dollar a ton on the quantity of ore the corporation mined in the past year, but in view of the fact that this was more than twelve months' requirements, and that it would mean exhaustion of the present known holdings in less than 60 years, it would be safe to assume $1.50 a ton as the amount required to take care of this ore. This is an amply safe estimate, as a study of sinking fund tables would show, since an earlier conversion of ore into cash would rapidly increase the total sinking fund at the end of the 50 years when the bonds mature.

The steel corporation's official statement, as brought out in the Hodge litigation over the bond conversion plan, puts the total assets of the corporation at $1,400,000,000, of which ore constitutes just one half, the other half being made up of coal, natural gas, railroads, plants and cash and cash assets. The statement made an argument for par or face value for all the outstanding securities. To follow the corporation's estimate of value in the Hodge case, an estimate it is needless to say not concurred in by anyone on the outside, would require the retirement of $400,000,000 more of securities, par value, against the exhaustion of ore. To retire that amount of stock, at par, would require a 50-year 4 percent sinking fund of $3,000,000 annually, equal to 50 cents a ton on 15,000,000 tons of ore annually. In view of the fact that such sinking funds would be to retire a 7 percent stock selling now between $80 and $90, and thus yielding 8 or 9 percent, or a 4 percent common stock selling between $30 and $40 and thus yielding now from 10 to 13 percent, and that they could be invested in such stocks, a 4 percent return on the funds is a very low assumption. A high rate of return would surprisingly decrease the necessary annual contribution, and still provide the actual par value for retirement at the end of the period.

In view of these facts, the integrity of the securities depends on the continuance of the present profit on ore, fig-

uring ore mined as worth the market price, and allowing other profits to set against the claimed assets represented in the departments making them. Our ore statistics presented last week showed that the corporation furnished 58.5 percent of the total Lake Superior shipment in 1902. Its proportion of the total ore in the region, even considering tonnage and not value per ton, is much greater than that, and in addition it mined and shipped a greater excess over a year's requirements than did outside interests. The conclusion is therefore that outside interests are exhausting their proportion of the reserves more rapidly than is the steel corporation, and if this is to continue, it necessarily means that the dominance of this one interest will increase and the value of its ore per ton will correspondingly increase.

While the prices paid for Lake Superior ore properties by the consolidations existing just before the steel corporation was formed were considered high, they were moderate in comparison with the prices now asked and in many cases paid. There has been considerable discussion of the probable acquisition of the Hill ore properties on the Mesabi range by the corporation, and the figure reputed to be asked for these is astonishing in comparison with what ruled only three or four years ago. Mr. Hill, it is understood, has taken the estimates of the steel corporation officials, as contained in recent affidavits, at par, and asks no less than $1 a ton for his ore in the ground. If such a basis of values is maintained on Lake Superior ores from this time on, it would not matter so greatly whether the steel corporation made extensive additional acquisitions; for any steel company buying these mines on such a basis would be distinctly handicapped in competing against the corporation with its vast reserves acquired at far lower figures. Another consideration not to be lost sight of in this connection is that the United States is not so well equipped for world conquests in steel as we have been wont to suppose, if our starting point becomes actually, and not theoretically, $1 a ton for Lake Superior ore in the ground.

FOREIGN TRADE IN IRON AND STEEL IN 1902.

The story in figures of how, in the year 1902, our exports have declined and imports increased in iron and steel and the finished products is now complete in the published report of the Treasury Department for December. In pig iron, there has been a steady increase of imports, from 7,633 tons in January to 118,373 tons in December, October alone of the twelve months showing a decline. The total for the year, 625,383 tons, is almost exactly ten times the total for 1901. While the imports of steel have not been with regular increase, as in the case of iron, the imports for December, 23,733 tons, were about the average for the year and the total for the year was more than 33 times that of 1901. The following table shows the pig iron and steel imports since Jan. 1. The column of steel includes ingots, blooms, slabs, billets and bars of steel and steel "not elsewhere specified," structural steel being thus included:

IMPORTS OF PIG IRON AND STEEL—GROSS TONS.

	Pig Iron.	Steel.
January	7,633	5,312
February	8,007	2,235
March	18,184	6,570
April	19,067	13,005
May	30,508	24,388
June	32,258	35,588
July	62,106	36,124
August	79,447	39,027
September	82,196	27,726
October	67,204	32,036
November	100,400	27,684
December	118,373	23,733
	625,383	273,428

The imports of rails have decreased from 14,365 tons in October to 6,027 tons in December. Those of tin and terne plates have increased from 306 tons in October to 6,446 tons in December. Imports of scrap have increased from 10,502 tons in November to 12,149 in December. The following table gives in detail the imports for December and for the year:

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	December		Twelve Mos. Ending December	
	1901	1902	1901	1902
Pig iron	9,641	118,373	62,930	625,383
Scrap	1,091	12,149	20,130	109,510
Bar iron	1,579	2,846	20,791	28,354
Iron and steel rails	417	6,027	1,905	63,522
Hoop, band or scroll	4	130	2,973	3,361
Steel ingots, slabs, billets or bars	1,036	23,733	8,163	273,428
Sheets and plates	623	3,929	5,621	10,063
Tin and terne plates	10,292	6,446	77,394	57,710
Wire rods	1,497	2,775	16,807	20,382
Wire and wire articles	276	298	4,128	3,470
Total	26,458	176,706	220,832	1,094,059

The total value of iron and steel imports for December not including ore was $4,701,865 against $2,127,153 in December, 1901. For the year the total was $41,468,826 against $20,395,015 in 1901 and $20,443,911 in 1900. Iron ore imports in December were 102,445 tons against 79,613 tons in December, 1901. For the year the figures are 1,165,470 as compared with 966,950 in 1901.

Exports for December were 2,413 tons more than for November and 23,744 less than for December, 1901. For the year the total exports were 1,103,664 tons against 710,679 in 1901. For the year the values are: for 1902, $97,892,036; for 1901, $102,534,575. These values, however, include builders' hardware, cuttlery, machinery and other iron and steel manufactures in addition to those exports named in the following table:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	December		Twelve Mos Ending December	
	1901	1902	1901	1902
Pig iron	5,368	1,210	286,687	27,487
Scrap	601	371	14,199	9,411
Bar iron	569	3,063	18,238	22,262
Wire rods	694	3,413	6,867	24,520
Steel bars (not wire rods)	2,766	593	27,402	9,300
Iron rails	.....	1	901	211
Steel rails	15,823	601	218,055	67,455
Billets, ingots and blooms	1,328	.....	28,614	2,409
Hoop, band and scroll iron	501	128	1,715	1,678
Iron sheets and plates	491	177	7,809	4,117
Steel sheets and plates	1,390	881	22,930	14,870
Tin plates, terne plates and taggers' tin	10	25	439	1,565
Structural material	4,916	2,063	54,005	53,859
Wire	8,919	6,259	88,252	97,843
Cut nails	568	427	9,306	7,169
Wire Nails	1,637	2,439	18,772	26,584
Other nails, including tacks	190	348	1,896	2,244
Total	45,771	22,027	710,679	1,103,664

At a meeting of the iron committee of the Central Freight Association held in Cleveland, it was decided to reduce the rates out of Cleveland to Johnstown and Connellsville, making them the same as the rates from these Pennsylvania towns to Cleveland, which means a reduction of 1½ cents a hundredweight on manufactured iron.

The Burlington Gold Mining Co., of Peoria, Ill., which operates the Republic group of mines in Yavapai county, Arizona, has recently been developing a body of iron ore found on its property. It is a magnetic ore, carrying from 50 to 60 percent metallic iron and running about 12 percent in silica. The mine is on a railroad and is said to be conveniently located with respect to fuel supply. The company has plans for building a furnace to utilize its ores.

Florian Grosjean, president of the Lalance & Grosjean Mfg. Co., Brooklyn, N. Y., died Jan. 24, aged 79. He was a pioneer in this country in the manufacture of stamp and sheet metal and enameled wares.

REPUBLIC IRON & STEEL CO.

The statement of the Republic Iron & Steel Co. for six months ended Dec. 31, 1902, compared with the same period in 1901 is as follows:

	1902	1901		Changes
Profit after all expenses save repairs and renewals	$2,091,887	$1,419,549	Inc.	$ 672,338
Imp. & repairs	546,965	486,426	Inc.	60,539
Balance	$1,544,922	$ 933,123	Inc.	$ 611,799
Cost of dismantled plants	160,799	.....	Inc.	160,799
Net profits	$1,384,123	$ 933,123	Inc.	$ 451,000
Pref. divs. 6 mos.	712,491	711,616	Inc.	875
Surplus	$ 671,632	$ 221,507	Inc.	$ 450,125
Previous surplus	1,934,389	1,109,665	Inc.	824,724
Total surplus	$2,606,021	$1,331,172	Inc.	$1,274,849

A comparison of the company's position Dec. 31 and at the end of its first fiscal year, June 30, 1900, is as follows as shown by the balance sheet:

Liabilities:	1902	1900
Capital stock	$47,547,900	$47,497,900
Accounts payable	4,783,429	1,023,907
Dividend due	356,245	355,370
Deferred installments	111,000	214,000
Reserve for taxes, etc.	120,506	55,988
Other reserve	68,976	.....
Surplus	2,606,020	2,222,049
Total liabilities	$55,594,079	$51,369,216
Assets:		
Plant, etc.	41,234,414	41,142,251
New construction	5,282,699	1,218,203
Stocks, sundry companies	309,200	547,200
Gas pipe line, etc.	448,844	116,730
Inventory	4,195,774	4,132,730
Receivables	3,168,556	3,008,968
Cash	954,588	1,203,132
Total assets	$55,594,079	$51,369,216

Nearly all the new construction of two years and a half has been paid out of working capital, with the exception of $380,000 derived from surplus. The expenditure for repairs, renewals and depreciation has been $2,444,157 in two years and a half. President Thompson says the company has acquired ore properties making now a total of 19,000,000 tons, or enough to supply the company's plants for thirty years. He complains of transportation facilities.

Steel Corporation Has Orders for 5,500,000 Tons.

A meeting of the directors of the United States Steel Corporation was held at New York, Feb. 3. At its close Judge Gary, chairman, gave out the following statement: "The subsidiary companies of the United States Steel Corporation at the present time have orders on their books for over 5,500,000 tons, which are the largest unfilled bookings that they have ever had. The books for subscription to stock under the profit sharing plan closed Saturday evening, Jan. 31, and the stock was subscribed for as follows: Exactly 27,633 men subscribed for 51,125 shares. Class E, composed of men who receive salaries of $800 to $2,500 a year, subscribed for 29,013 shares, 14,260 men subscribing. Class F, composed of men who receive $800 or less in wages, subscribed for 15,038 shares, 12,170 men subscribing. The board of directors voted to allot to class F all the stock they subscribed for; and to class E 90 percent."

Stephen J. Meeker, malleable iron founder and president of the Smallie Coupling & Mfg. Co., of Newark, N. J., assigned Feb. 2. The failure is due to the indorsement of notes by Mr. Meeker of the Smallie Coupler Co. The Meeker foundry has a capacity of 8 tons daily.

Those employes of the Titusville Iron Co., Titusville, Pa., who had been in the employ of the company all of the past year were paid an extra amount last week equivalent to 5 percent of their earnings for the year. This is the second distribution of the kind made by this company.

DISTRIBUTION OF SHARON-UNION PRODUCTS.

(Special Telegram.)

PITTSBURG, Feb. 4.—The American Steel & Wire Co. on Monday, Feb. 2, took over the entire rod, wire and wire nail mill products of the Sharon and Union Steel Co. plants. On Dec. 1, immediately following the merger of the Sharon and Union companies, the selling agency of the two was removed to this city to the offices of the Union Steel Co. This agency on the products named above has now been taken over by the wire end of the United States Steel Corporation. Taking over the sale of these products also means that the American Steel & Wire Co. will operate the rod, wire and wire nail plants. While no official announcement has been made it has been definitely decided to abandon the pipe mill at Sharon and the plate mill, which can roll up to 60 inches in width, and which was to furnish skelp for the pipe mill, will operate on plates under the supervision of the Carnegie Steel Co., the product going to the Standard Steel Car Co. at Butler, Pa. The sheet plant at Sharon will not be removed, as has been reported, but will be operated in due time under the supervision of the American Sheet Steel Co. It has been erroneously stated that the mills would be removed to Vandergrift, Pa. The blast furnaces, blooming, billet and bar mills, together with the open-hearth plant, will be operated by the Carnegie Steel Co., while the American Tin Plate Co. will of course continue its arrangement with the tin plate mills at Sharon. W. H. Donner, vice president of the Union Steel Co., has been requested to remain in charge of the new work at Donora, Pa., but has not yet definitely announced his intentions. J. P. Whitla, formerly general sales agent of the Sharon Steel Co., has tendered his resignation. John Stevenson, Jr., has been requested to remain at Sharon in charge of the heavy operating end there, but has already made plans for a trip to Europe.

Espen-Lucas Machine Works Extensions.

The Franklin Machine Works plant, Philadelphia, recently passed under the hammer and the designs, drawings, cuts, machinery, tools, jigs, etc., became the property of the Espen-Lucas Machine Works, of Philadelphia. A number of the employes of the former company have entered the service of the other concern, as Mr. Lucas was formerly connected with the Franklin Machine Works as superintendent and in that capacity was responsible alike for the construction and the design of all the machines built. The Espen-Lucas Co. will have a greatly increased capacity and be in position to make further improvements in the delivery of their products as well as promptly supply entire machines or duplicate parts formerly made by the Franklin Machine Works. The progress of the Espen-Lucas Machine Works has been noteworthy. It was formed less than a year ago and now has extensive floor space with modern equipment at Broad and Noble Sts., Philadelphia. A specialty is made of cold saw cutting off machines as well as boring and milling machines and special machinery.

Strike in Limestone Quarries.

A strike in quarries of the Lake Erie Limestone Co. and the Union Limestone Co., about twenty miles east of Youngstown, may cause a number of blast furnaces to bank unless soon ended. Trouble began Monday when Italians employed in five quarries, which supply blast furnaces of both Mahoning and Shenango Valleys with limestone, objected to a change in the mode of paying them. They had been paid by tonnage; the new rule is to pay them $2 a day, a little less than industrious quarrymen could make under the old rule. There was a battle between sheriff's deputies and strikers Monday, and many shots were exchanged, but no one was killed. Tuesday and Wednesday the quarries were idle but there was no violence. The strikers are not union men.

The Anderson, Ind., plant of the American Tin Plate Co., was damaged by fire last week. The loss is estimated at $25,000.

The Machinery and Metal Working Trades—News Letters from Selling Centers.

NEW YORK.

OFFICE OF *The Iron Trade Review*, ROOM NO. 1009, 150 NASSAU ST., Feb. 3

The month of January in the machinery industry in this vicinity was marked by some good business. The orders given out were not for large amounts, yet they were so numerous that their total represented very profitable trading. The December prediction that many orders held in abeyance then would be given out in January, was fully realized. The orders, too, were widely distributed.

The machine tool trade figured largely in the month's developments. Railroads were frequent buyers, but generally for one or two tools at a time. It was noticed that buying of tools to replace old ones now in use, and by established firms, was considerable. The largest purchaser was the American Locomotive & Machine Co., of Montreal, Que., which bought over $300,000 worth of machine tools, and some $85,000 worth of cranes. The greater part of the order was captured by the John Bertram & Sons Co., Ltd., of Dundas, Ontario, and aggregated about $150,000. The Niles-Bement-Pond Co. got an order for large tools and cranes that amounted to about $130,000. The J. W. Cregar & Co., of Philadelphia, figured in the order to the extent of about $65,000, and Manning, Maxwell & Moore, of 95 Liberty St., for about $30,000. As regards keenness, the competition for this order could hardly be exceeded.

The probable price of raw material is affecting the machinery business to some extent. So much has been said and written about reduced prices for pig iron being imminent, that in some quarters there is a tendency to hold orders for machinery until something definite in this direction is known. Manufacturers of special machinery speak in this strain particularly.

Taken as a whole, deliveries during the month showed an improvement. In standard tools, while an order can be filled now more promptly than for some time, few if any manufacturers can be found whose stock on hand is up to their requirements. If orders come in as freely during the present month as in January, the belief is expressed that there will be a return to the conditions which prevailed for the greater part of last year, when more was heard about inability to execute orders than about securing them. Deliveries of large tools are only a shade more satisfactory than heretofore.

Prices during the month were well maintained, but one firm is pointed out as departing from average prices enough to get some good orders, which otherwise might have been shared with a number of competitors.

The foreign trade for the month, so far as machine tools were concerned, was without any new feature. It gave added evidence that as long as orders from domestic sources continued to come in as satisfactorily as they have, American manufacturers will confine their efforts to this country. In electrical equipment, orders from abroad show an increase. Manufacturers in these lines are encouraged to extend their business abroad, and report some good business in sight. Orders for mining machinery for South Africa were more plentiful during January than for some time. The Rand Drill Co. and the Ingersoll-Sergeant Drill Co. being particularly represented.

Views as to the outlook for trade continue optimistic. There is no denying that the general condition of the machinery business is better today than at this time a year ago. Comparisons made by firms between the amount of business done in January of the two years show this. Considerable talk is heard about railroads becoming large purchasers of machine tools in the near future, either of equipment for additions to their repair shops, or of modern tools to replace those long in use.

Widely published reports have referred to a meeting of prominent emery wheel manufacturers appointed to be held at the Fifth Avenue Hotel, this city, for the purpose of forming a combination. No such meeting was held and the representatives of manufacturers in this city knew nothing about it. Neither did they receive any visits from their principals, which is perhaps conclusive evidence that no conference was held. That a consolidation is under consideration is freely admitted, but it is thought to be still a long way from realization. It is stated that an agreement as to prices is the main thing desired, there being quite a discrepancy at present. The proposal of a consolidation is not new, but all other attempts have been given up.

The new Hotel Belmont, 42nd St. and Park Ave., New York, will have for its engine equipment one 225-h. p. and three 300-h. p. medium speed, tandem compound, four valve engines, direct connected to 150-k. w. and 200-k. w. generators. The contract for the engines has been awarded to the Fitchburg Steam Engine Co., through its New York office, Edwin H. Ludeman, manager, 39-41 Cortlandt St. The Fitchburg Co. recently furnished the John Stephenson Co., car builder, Elizabeth, N. J., one 475-h. p. engine of the same type, and is building two 300-h. p. compound engines for driving direct connected alternators for the new hat factory of Fred Berg & Co., Orange Valley, N. J.

In electrical machinery, January has been marked by exceptionally heavy business. The Crocker-Wheeler Co., 39 Cortlandt St., notes a decided increase. Large orders taken by this company in the month include two 150- and one 75-k. w. engine type generators, from the Manhattan Transit Co., New York City; one 100-k. w. engine type generator, from the Barbour Flax Spinning Co., Paterson, N. J.; thirteen motors, the highest 7½ horsepower from the Sackett & Wilhelm Lithograph Co., New York City; one multiple voltage equipment, from the Ansonia Brass & Copper Co., Ansonia, Conn.; six 25-k. w. generators, for the public baths, in New York City; three additional small motors, for the McGill University, Montreal. The foreign business of the company is excellent, particularly in Mexico, from which one order aggregating $8,000 was received recently. Another foreign order was for a 50-k. w. generator, for installation in the Government printing office in Manila.

M. H. Treadwell & Co., of 95 Liberty St., have received so many inquiries for their specialties recently that M. H. Treadwell has been in the West during the past two weeks, giving them his personal attention. The company has some important contracts pending.

The Chapin-Love Machine Co., of 125 Worth St., this city, reports an exceptionally good demand for sensitive drills, particularly for 6-, 10- and 14-inch bench and column drills, and is in receipt of many letters on their efficiency from those who have installed them. This company's business has so grown in the past year that increased quarters are among the probabilities of the near future.

Although the engine business is looked upon as satisfactory, particularly at this time of the year when dullness is expected, several interests say that they never remember a time when so many orders were withheld. Some contracts which were expected to be given out early in January are still held up.

At the local office of the Exeter Machine Works, of Pittston, Pa., at 120 Liberty St., some good orders for hoisting engines for contracting and mining purposes have been taken recently.

The Prentiss Tool & Supply Co., of 115 Liberty St., report that orders covering all of the machine tools the company handles, received in January, were the largest for several months. One was for 25 lathes for a shop in Worcester, Mass.

The Rockwell Engineering Co., of 26 Cortlandt St., this city, has more orders on its books now for fuel oil burning appliances than at any time since it started in business. Mail requests for new catalogues "B" and "C" are numerous.

CHICAGO AND THE WEST.

OFFICE OF *The Iron Trade Review*, 519 MONADNOCK BLOCK, Feb. 3.

Manufacturers of machinery throughout the West report a heavy volume of trade in the opening month of the

new year. From reports received there is every prospect of a continuance in 1903 of the excellent business that was done last year. A large number of concerns are having difficulty in getting castings, and those that operate foundries in connection with their plants, in getting regular supplies of pig iron and coke. The delays in shipments of raw material have seriously retarded the completion of orders, and many complaints are received on this score. Few concerns started the new year with clean books, some being six months behind, and others one to three months. The foreign trade of manufacturers in this territory has been very brisk. Shipments of ice machinery have been made by the Winslow Elevator & Machine Co., Chicago, to Australia and the Argentine Republic; of precision bench lathes made by Hardinge Bros., Chicago, to London, Eng.; of drill grinders made by Wilmarth & Morman Co., Grand Rapids, Mich., to Nova Scotia, England, New Zealand and South America; of drills and lathes made by B. F. Barnes Co., Rockford, Ill., to France, Australia, Sweden, Holland, India, and Switzerland. The domestic trade of manufacturers of machinery and equipment, has been exceptionally large, and as expressed by one concern, the wonder is where it all goes to.

Winslow Elevator and Machine Co., Chicago, manufacturer of passenger and freight elevators, ice machinery, ornamental iron work, etc., reports that all departments are crowded with work. It is just completing a 70-ton ice machine for shipment to Sydney, New South Wales, and has orders on its books for two 100-ton ice machines to be shipped to the Argentine Republic. Inquiries from South Africa have also been received for these machines.

Charter Gas Engine Co., Sterling, Ill., informs us that the business done in December of last year was greater than the sales of any preceding December since the company was organized. Five carloads of machinery were shipped to different parts of the country, besides a large number of local installations during the month. Last spring the capacity of the plant was increased by the erection of a new building, and an addition to the foundry will be made this spring. New machinery is constantly being installed as the demands of trade necessitate it. The company anticipates a flourishing year in 1903.

Stephens-Adamson Mfg. Co., Aurora, Ill., manufacturer of elevating, conveying and power transmitting machinery, reports that the demand for its line of machinery is very satisfactory, and that the prospects are that 1903 will be a prosperous year. The shops are full of work, orders for power transmission appliances, such as shafting, pulleys, manila rope sheaves, etc., being of good volume. It contemplates purchasing new machinery in the near future.

Wilmarth & Morman Co., Grand Rapids, Mich., manufacturer of drill grinders, reports, shipments of its machines to the following concerns: Chicago Great Western shops at Oelwein, Ia.; Vulcan Iron Works, Wilkesbarre, Pa.; American Brake Shoe Co., St. Louis, Mo. (also a "Whale" grinder); Rogers Locomotive Co., Paterson, N. J.; St. Louis & Francisco R. R. Co., two machines; Allentown Rolling Mills Co., Allentown, Pa.; Chicago, Milwaukee & St. Paul shops, Milwaukee; Standard Millwork Co., Cincinnati; John W. Swan Co., Lima, O.; Electric Machinery Co., Minneapolis, a 500-volt direct connected motor driven drill grinder; El Paso Foundry & Machine Co., El Paso, Tex.; Buff & Buff Mfg. Co., Jamaica Plain, Mass. Its shipments to foreign countries include eight drill grinders to England; one to Auckland, New Zealand; one large direct connected motor driven drill grinder to a leading railway company in South America, and one of the large "Whale" grinders, style "G," to the Dominion Iron & Steel Co., Sydney, Nova Scotia. Special attention is called to this machine, since it is the only drill grinder made in the world for the grinding of drills as large as five inches. The company reports that its shipments during December of last year were 25 percent greater than in the same month a year ago. January business has been heavy, orders for seven machines being received in one day's mail.

Maywood Foundry & Machine Co., Chicago, manufacturer of molding machines, reports shipments of brake head machines to the Acme Steel & Malleable Iron Works, Buffalo; Pennsylvania Malleable Co., Pittsburg; West Side Foundry Co., Troy, N. Y.; Bullock Electric Mfg. Co., Cincinnati, and the Bollman-Wilson Foundry Co., Cincinnati.

B. F. Barnes Co., Rockford, Ill., manufacturer of machine tools, upright drills and lathes, reports that it is running to the fullest capacity, and that for some time the plant has been running on over-time work in the effort to keep up with the flow of orders. Notwithstanding, the company is more or less behind, owing to the large volume of business, the scarcity of cars and the difficulty in securing pig iron and coke. An exceptionally good business is being developed in foreign countries, large shipments having been made recently to France and Australia, and smaller ones to Sweden, Holland, and India. Work is now being completed in the shops for shipment to Paris, France, and Geneva, Switzerland. The volume of orders received in the first three weeks of January was greater than the company anticipated for the whole month, and the number of inquiries daily received reassures the company of a continuance of the excellent business of last year.

Bignall & Keeler Mfg. Co., Edwardsville, Ill., manufacturer of pipe threading machinery, reports that the business done last year was the largest in its history. It contemplates bringing out several new machines this year. Additional buildings to the plant are under advisement, though plans have not been definitely agreed upon as yet. Orders and inquiries in January have been very satisfactory.

Ransom Mfg. Co., Oshkosh, Wis., manufacturer of grinding and polishing machinery, has received orders for electrically driven grinders from the Allis-Chalmers Co., Carnegie Steel Co., United States Navy Yards, Newport News Shipbuilding & Dry Dock Co., and the Wellman-Seaver-Morgan Engineering Co. Orders have also been received for the same machine from South America and Mexico. It reports that the demand for belt-driven grinders continues good.

George Whiting Co., manufacturer of punching, shearing and bending machinery, Chicago, reports trade satisfactory and no difficulty in making collections. A number of contracts are being negotiated for deliveries in the first half of the year, and the outlook for trade for this period is very good. Inquiries for tools have been received from several foreign countries, the company having recently established agencies in several European cities. A few of the orders lately received are as follows: One combined belt power riveter and punch with stake 50 inches long, capable of driving ⅝-inch cold rivets or to punch ½-inch hole in ¼-inch plate, for the S. Freeman & Sons Mfg. Co., Racine, Wis.; one belt power riveter with stake 50 inches long, capable of driving ⅝-inch cold rivets, for the Atlas Engine Works, Indianapolis, Ind. This is the second order from this company. From the Worden-Allen Bridge & Structural Iron Works, Milwaukee, Wis., an order was received for one heavy beam coping punch, one belt power punch with 24-inch throat, architectural jaw, capacity to punch 1⅜-inch hole in 1⅜-inch plate; one belt power punch with 48-inch throat, architectural jaw, capacity, ¾-inch hole in ¾-inch plate; one 15-inch punch with plain jaw, capacity to punch ¾-inch hole in ¾-inch plate; one set of belt power bending rolls, 72 inches long between housings, capable of bending ½-inch plate, etc.; from A. Bolter's Sons Structural Iron Works, Chicago, one belt power punch with 42-inch throat, architectural jaw, capacity to punch 1-inch hole in 1-inch plate; from Torbert & Peckham Car Works, Hammond, Ind., one boilermakers' combined punch and shear with 42-inch throat, capacity, 1-inch hole in 1-inch plate.

Ellington Mfg. Co., Quincy, Ill., manufacturer of Cornell gasoline engines, reports a good business, among the orders received being several from Australia. Within the past six months, the company has made a number of improvements in its engine, including a new electric ignitor,

which works with perfect satisfaction, and which it believes to be the best ignitor on the market.

American Well Works, Aurora, Ill., manufacturers of pumping machinery, air compressors, etc., are just completing and arranging the machinery in a brick addition to the machine shop, 80x300 feet. All the tools are electrically driven. Order books are full and the company looks forward to a very busy year. Trade from foreign countries has been very good.

Quincy Engine Works, Quincy, Ill., manufacturer of vertical and horizontal Corliss engines, reports recent shipments of two engines of 1,000 h. p. each to the Elizabeth, Plainfield & Central Jersey Railway Co., to be installed in its new power house at Cranford, N. J. The company contemplates increasing the capacity of its machine shop by installing several new machine tools.

Nordberg Mfg. Co., Milwaukee, Wis., manufacturer of engines, etc., reports that its books are full of orders and that it will take fully six months to catch up with same.

Heine Safety Boiler Co., St. Louis, reports among its sales of boilers in past month, the following: Two 150-h. p. boilers to the American Type Founders Co., for its plant at Communipaw, N. J.; four 366-h. p. boilers to the Electric Co. of America, for its plant at Scranton, Pa.; three 335-h. p. boilers to the Syracuse Lighting Co., Syracuse, N. Y.; two 312-h. p. boilers to the Pennsylvania Water Co., Wildwood Station, Pittsburg; six 261-h. p. boilers to Pardee Bros. & Co. for their Hazelton, Pa., mines; two 300-h. p. boilers to the Pittsburg Engineering Co., for the Charleston Gas & Electric Co., Charleston, W. Va.; three 580-h. p. boilers to Pettibone & Mulliken Co., for Strom Mfg. Co.

Reliance Electric Co., Milwaukee, Wis., manufacturer of dynamos and motors, has just completed an addition to its plant, increasing the output 25 percent. The company is running its plant to the fullest capacity.

Joseph T. Ryerson & Son, Chicago, are not experiencing any dullness in their machinery department, the demand for heavy tools being particularly large. A heavy business in 1903 is anticipated.

Hardinge Brothers, Chicago, manufacturers of precision lathes, tools and special machinery, report that they made a good sized shipment of bench lathes to London last month. They have had a good demand for this machine, capacity being taxed to the utmost in keeping pace with orders for it.

S. Freeman & Sons Mfg. Co., Racine, Wis., manufacturer of boilers, etc., reports that the new year has opened with an encouraging volume of orders. During January contracts were taken in the first three weeks for upwards of $30,000 worth of work, with more than $80,000 worth in sight. Among the jobs completed and shipped last month were the following: Three 300-h. p. corrugated furnace boilers for P. H. & F. M. Roots Co., Connersville, Ind., who are to use them for an irrigation plant in Texas; one large storage tank, smoke stack and thirty cone tanks for the Warner Sugar Refining Co., Waukegan, Ill.; two 250-h. p. corrugated furnace boilers for the C., B. & Q. R. R. Co.; one set of water jackets for blast furnace for the Tennessee Copper Co., Ducktown, Tenn. Orders were received during the month for the following: Two 200-h. p. corrugated furnace boilers for the LaBelle Iron Works, Steubenville, O.; one 450-h. p. corrugated furnace boiler for E. P. Mueller Co., Milwaukee, Wis.; one 200-h. p. corrugated furnace boiler for the Council Bluffs Water Works, Council Bluffs, Ia.; one 100-h. p. horizontal tubular boiler for the Brent Lumber Co., Pensacola, Fla.; two 150-h. p. boilers for Chicago concerns, and a large order for tanks and boilers for the H. W. Johns-Manville Co., Milwaukee, Wis. The company intends building an addition to its boiler shop next spring, 100x100 feet. All the material for this building is on hand.

With the completion of the two wings just erected and now occupied, the Northern Electrical Mfg. Co., Madison, Wis., is prepared to handle the natural increase in its business, although the new quarters are already crowded. The wings are 38x100 feet and 88x100 feet respectively, of solid brick construction. The former is jointly occupied by the pattern makers, brass workers and boxers, all formerly working in crowded quarters in the main shops. The large addition is shared by the paint shop and power plant, which are separated by a fire wall. The power plant contains two generating units. The larger carries the day load and the smaller supplies the power required by the night shift. Incandescent lights are supplied by a motor-generator which is operated by the direct current used in the shop, delivering alternating current for the light. The generators are 200-k. w. and 50-k. w. capacity respectively, built by the Northern company and are direct connected to a 225-h. p. Vilter Corliss engine at 100 r. p. m. in the first instance and a 75-h. p. Ball engine at 290 r. p. m. in the second instance. Two 250-h. p. boilers supply steam for the operation of the plant. The exhaust steam is used in heating the works.

CINCINNATI.

Feb. 3.

The reports of machine tool manufacturers and the machinery trade in general are cheerful and the outlook for a continuance of activity is regarded as most favorable. January orders were good and every shop is running up to capacity, with orders ahead, although early deliveries are more easily obtained now than ninety days ago. The completion of new plants and the addition of facilities has greatly improved the ability of the shops to turn out orders more promptly. Prices are well maintained with no change from present schedules contemplated at present. Foreign orders are still an unimportant feature of the trade, but some manufacturers note improvement in this direction. Extensions and additions to plants, adding new machines and increasing facilities continue to be noted among Cincinnati concerns, and this is a feature which bears strong testimony to the satisfactory trade that is being enjoyed and the confidence in the future.

The Dreses Machine Tool Co. has found it necessary to increase its capacity to keep up with orders. Foreign trade is improving. A shipment of large radial presses will be made to England. As soon as the weather will permit the company will begin work on an extension 60x60 feet, two stories in height. It will be built in the rear of the present location.

J. H. Day & Co., manufacturers of special machinery, are just completing their new building which was constructed to be used as a stock room. The new foundry building which they have under way has been much delayed by bad weather and will not be completed before July 1. They report trade excellent and plenty of new business coming in right along.

Schumacher & Boye report a good demand for lathes and regard the outlook for the coming year with full confidence. They are now taking bids on a new building 100x200 feet and will commence construction as soon as weather permits.

The Cincinnati Engine & Machine Co., capital $10,000, was incorporated at Columbus on Jan. 22. The incorporators are Otto Creutz, Anton Groeschel, Walter Bohrer, Frank Matt and H. W. Smiley. The company will manufacture hot air machines. They have not yet selected a location. Walter Bohrer is a son of Geo. H. Bohrer, president of the German National Bank, and Frank Matt is connected with the same bank.

The Hisey-Wolf Machine Co., located at 77 and 79 Elm St., manufacturer of portable electrically driven grinders and electrically driven bench grinders, has leased the adjoining building at 75 Elm St. and will locate its offices and stock rooms there, thus permitting the use of the entire space in present quarters for manufacturing. The company contemplates further additions to its facilities in the spring.

The S. Obermayer Co. reports that the business outlook for 1903 is extremely bright. Improvements and additions to the company's various plants will be made in the near future.

The Bullock Electric Mfg. Co. reports no falling off in orders and has enough work ahead to keep the plant busy for some time. The company is still running night and day, as for the past two years.

The G. A. Gray Co., manufacturers of planers, has purchased a piece of property opposite its plant on Depot St., 90x80 feet, at a cost of $3,500. The company will erect a warehouse.

The L. Schreiber Sons Co., manufacturer of architectural iron, will erect a large plant at Norwood, having a 14-acre site there. The engineers of the company are now at work drawing up plans for a large power house and foundry building. The new structure will be 400 feet long and 110 feet wide. The building will be of steel and pressed brick. The new buildings are to be ready for occupancy this fall.

The Cincinnati Planer Co. reports a nice run of orders and trade satisfactory. It is putting in a new 150-h. p. Corliss engine as the old engine was too small for their needs.

The Cincinnati Shaper Co. has now been in its new plant on Elam St. about thirty days. Trade is good and everything working satisfactorily.

The McIlvaine & Spiegel Boiler & Tank Co. reports business brisk and orders in January heavy, especially local orders. The company has received orders for twelve new boilers for Cincinnati concerns alone in the past month.

The J. A. Fay & Egan Co. has taken a contract for several wood-working machines for export to Brussels, Belgium.

Greaves & Klausman have lately taken orders for six of their large lathes to be shipped to New Zealand.

CLEVELAND.

OFFICE OF *The Iron Trade Review*,
1064 ROSE BUILDING, Feb. 4.

The year has opened most auspiciously in this city. Manufacturers of and dealers in machine tools, almost without exception, say that January of this year makes a better showing in sales than January, 1902. There has been little change in prices since July and none is expected in the near future, but dealers are confident that they will be able to maintain present quotations.

The W. M. Pattison Supply Co. will now begin the erection of its new warehouse, which will be 190x160 feet, three stories, with a C. & P. R. R. switch running into the building.

The Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., is doing a large business constantly increasing in this territory, in which G. R. Lamb is the representative.

The Cleveland Crane & Car Co., Wickliffe, near Cleveland, advises us that the condition of new work, so far as it relates to that company's business, is much better than it was one year ago. It has more inquiries and more orders booked than it had at this time last year.

The Chisholm & Moore Mfg. Co. reports that the general malleable trade is opening very promisingly and a good year is expected.

Announcement is expected of the removal of the Aurora plant of the Chicago Pneumatic Tool Co., and its consolidation with the Cleveland plant, formerly operated by the Chisholm & Moore Mfg. Co.

The Snider-Hughes Co., builder of pumping machinery, has just moved into its new plant. It reports prospects for business in 1903 appear exceptionally good.

The Elwell-Parker Electric Co. has recently contracted with the Alabama Steel & Wire Co., Birmingham, Ala., through the Garrett-Cromwell Engineering Co., for two special vertical pump motors of 250 horsepower each, for driving two Worthington centrifugal pumps. This is a new departure and is on a large scale.

Foote, Burt & Co. have orders on hand for at least 90 days' business. January has been an extremely good month, better than was looked for, and many inquiries are coming in. A large percent of these inquiries result in orders. The firm is increasing its plant to take care of growing business.

Kaltenbach & Griess, consulting and contracting engineers, who, as previously announced in these columns, expect to build a large plant at Bedford this year, anticipate that business for 1903 will be equal in volume to that of last year, if indeed it is not larger. Inquiries are brisk and prospects very favorable. The firm is increasing its force to take care of its business.

The Cleveland Punch & Shear Works Co. had a very satisfactory business during January, and considers the outlook for the ensuing year to be very bright. The company has received orders within a few days from the Locomotive & Machine Co., Montreal, a large concern recently organized, as reported in *The Iron Trade Review*.

The Upson Nut Co. finds that the outlook is for a very large volume of business in the new year. The situation, the company reports, is fully as favorable as it was this time a year ago.

The Reliance Gauge Column Co. reports that its business this year promises to equal, if not surpass, the business done in 1902, which was greater than any previous year. The demand for Reliance specialties seems to be constantly increasing.

Business for the year 1903 has opened in excellent shape with the Cleveland Pneumatic Tool Co., which is getting a large amount of new business and repeat orders from many old customers. The company is now located in its new plant at the corner of Hawthorne and Second Aves., where it has increased facilities and still more room to install additional machinery as trade grows and the demand requires it.

The Acme Machinery Co. has received several large orders in addition to the usual number of small or single orders for machines. The usual number of inquiries have been received, and the company has sent quotations out on large outfits of tools.

The Champion Rivet Co. notices a decided improvement in the demand for its product, and will not be surprised to see the market very firm for at least the first six months of the year.

The January shipments of the Chase Machine Co. are in excess of those for January of last year, and a fair number of orders are on hand. The company is extending its erecting room by a 60x44 foot addition, with a 15-ton traveling crane.

The Standard Welding Co. finds the general conditions of trade, as shown by the first month of the year, extremely satisfactory. The activity in the automobile trade, of which the company is interested in the accessories, is very marked. The automobile show in New York has largely stimulated the trade, and the company believes the outlook is most favorable for trade for months to come. The demand for all classes of tubing is very active. Collections are good. The railroad conditions are still unfavorable, and the shortage of coal and coke is causing the company considerable anxiety.

The plant which has just been vacated by the Snider-Hughes Co. is now occupied by the Cleveland Stamping & Tool Co., which will install some new machinery to increase its facilities.

The Kilby Mfg. Co. has closed a contract for a beet sugar plant for the Longmount Sugar Co., Longmount, Colo.

The Morgan Construction Co., Fort Morgan, Col., has awarded a contract for a beet sugar plant to E. H. Dyer & Co., Cleveland, who will furnish the complete equipment, including the machine shop.

The Schneider Machinery Co., dealer in new and second hand machinery, has moved from 126 Champlain St. to 28-30 Michigan St.

The name of the S. M. York Machinery Co. has been changed to the W. M. Pattison Machinery Co. S. M. York died several years ago, and the business of the company of which he was the head was sold to W. M. Pattison and associates.

The plant formerly occupied by the Cleveland Crane & Car Co. on Wason St., has been leased to George H. Bowler & Co., who will use it as a warehouse for second hand machinery.

The C. O. Bartlett & Snow Co. finds that the business outlook is excellent. It has all the orders it can possibly attend to, especially for dryers and elevating and conveying machinery. Prices are considerably higher than last year. Help seems to be plenty. The company finds that cast iron and all kinds of structural material can be had with less difficulty, and that the price of coal seems to be tending downward somewhat. The company looks for a busy season and an early spring opening.

PHILADELPHIA.

Feb. 3.

The first month of the new year has closed with a vigorous market and under conditions which leave little

cause for apprehension that there will be anything but good business for some time to come. In comparison with other months of the last half of 1902 the volume of business might be considered disappointing unless the time of year were taken into account. December and January are not deemed months in which the normal volume of business can be maintained; and even in extremely prosperous times it seems the case is without exception. In both months the inquiries for machinery were prolific; in January particularly so. But business has been as hard to close as in former years, due no doubt in great measure to the many matters requiring the attention of heads of concerns during the inventory season. Notwithstanding the conditions what might be termed a very satisfactory volume of business was reported for the closing days of the month.

A factor which lent much strength to the situation was the increase in the buying from the coal regions. Since the ending of the strike the demand for machinery from sources dependent very largely upon the operation of the mines has reached notable proportions, and the machinery trade in every department is benefited.

Machinery builders still complain of a great difficulty in procuring materials. An enormous amount of work in incomplete state is held up for want of necessary material. Steel products are very conspicuous among the shortages listed. Orders for steel castings placed three months ago are yet unfilled, and many machine tool builders and others are sadly delayed in their shipments in consequence. Collections have for some time been hard to make, but some builders note much improvement in this direction since the middle of the month.

In the matter of deliveries the market is easier. Machinery of an ordinary or standard character may be had with fair promptitude, but in the line of specials builders' facilities are still somewhat limited.

The number of large transactions reported for the month is rather smaller than for some time. The American Locomotive & Machine Co., of Montreal, has been prominent in the market as a buyer for its new plant, and almost every concern building machine tools has estimated on requirements in its line. A leading agent has booked orders for a good share of the $300,000 equipment to be purchased, covering many types of tools.

The Newton Machine Tool Works are exceedingly busy at their plant, and orders and inquiries are plentiful. They have awarded the contracts for their new buildings, and if possible will commence building operations in about two weeks. Much of the new equipment required has been ordered, but the electric cranes which they will install are not yet contracted for.

Bingham & Co., designers of oiling systems, have a great deal of work on hand. Their present quarters have become entirely inadequate for their business, and they have secured a large and commodious building at the foot of Cooper St., Camden, N. J., to which they will shortly remove.

At the Bourse reports on January business show it to have been very satisfactory. The J. W. Cregar agency did a very good business. They report a large order from the American Locomotive & Machine Co., of Montreal, which will amount to many thousands of dollars.

W. E. Shipley, who represents the Cincinnati Milling Machine Co., Lodge & Shipley, and other machinery concerns, states that January was a good month with him, and that his business for the year just closed was just double that of the preceding year.

W. S. Quigley, selling agent for the maker of the Charlier rolling furnace for the smelting of metals of all kinds, reports business in the furnaces in excellent shape, and that many installations were contracted for during the month. He also represents Quigley & Krastin, makers of automatic lathe chucks, collapsing taps, and self opening dies, and booked several orders of good size.

The J. W. Paxson Co., builder of foundry equipment, made some good shipments during the month, particularly of Paxson-Collion cupolas, some of which were the following: A No. 16 to the Acme Foundry Co., Brooklyn, N. Y.; a No. 20 to the Nazareth Foundry & Machine Co., Nazareth, Pa.; a No. 16 to the Horton Mfg. Co., Painesville, O.; a No. 8 to Isaac A. Sheppard & Co., Baltimore, Md.; and a No. 12 to the E. J. Moore Water Tube Boiler Co., Philadelphia. The company also installed several sand blast equipments. Its statistics show a largely increased business during 1902. It is usual with the company to compile figures covering every article sold, and sales were found to be unprecedentedly large, the percentage of increase being much in excess of the profits, which were affected by the unsettled cost of raw material.

The Falkenau-Sinclar Machine Co. reports that January was a good month. The company shipped a number of double crank presses and standard presses. Three large double crank presses went to one concern. There was also shipped a 200-ton hydraulic press, and a lot of hydraulic valve work. In the testing machine department the company shipped a 300,000-pound chain tester to Western parties, and a 20,000-pound testing machine to Purdue University.

I. H. Johnson, Jr. Co., formerly Israel H. Johnson, Jr., & Co., recently incorporated, builder of lathes, started the year under the new name very auspiciously. Shipments for the first month were quite numerous but largely for small to medium tools. One shipment covers two 30-inch by 47-foot screw lathes to the Hilles & Jones Co., Wilmington, Del.

Edwin Harrington, Son & Co., Inc., builders of machine tools, and manufacturers of cranes and hoists, say business is good in point of both orders and shipments.

The Tabor Mfg. Co., builder of molding machines, booked a good deal of business and made some heavy shipments. Among the orders recently placed are mentioned the following: Wheeler & Wilson Co., Bridgeport, Conn., a 16½x26 stripping plate machine; American Locomotive Works, Schenectady, N. Y., a 16x26, and an 18x26 split pattern machine; the General Electric Co., Lynn, Mass., two split pattern machines, 18x18 and 21x30, and an 18-inch power rammer; Michigan Brass & Iron Works, Detroit, Mich., a 13x18 split pattern machine; Brown & Sharpe Mfg. Co., Providence, R. I., a 13x19 split pattern machine, the Ajax Metal Co., Philadelphia, two 14x16 split pattern machines. They also shipped to Great Britain a 14x16 and a 24x24 split pattern machine. Mr. E. H. Mumford, the general manager of the company, left on Saturday for England whither he goes in the interests of the sales department.

Thos. H. Dallett & Co. have a lot of orders in hand for portable electric drills, pneumatic chipping tools, and other machinery in their lines.

There is considerable activity at the plant of the Barr Pumping Engine Co. The company is meeting a very large demand for small pumps, and business in this direction is increasing rapidly. The company has a good deal of work in hand of a large character, and among the recent large orders received is one for a 6,000,000-gallon vertical triple expansion pump for the city of Brockton, Mass. The pump is a duplicate of one supplied some time ago for the Washington, D. C., waterworks.

The Hess Machine Works, builders of file machinery, find orders coming in quite satisfactorily, mostly from abroad. They are making frequent shipments to England, France, Russia and other European countries.

F. R. Phillips & Sons Co., Philadelphia, last week shipped three carloads of machinery to New York, which together with the previous heavy shipments, about completes the equipment of the Italian tin plate plant this company is erecting.

The molders and coremakers employed by the Braddock Machine & Mfg. Co., Braddock, Pa., have gone on a strike on account of a misunderstanding over the allotment of apprentices.

The Nicola Lime & Fire Clay Co., Nicola, Armstrong Co., Pa., has been granted a charter with $30,000 capital.

PITTSBURG FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the Pittsburg Foundrymen's Association was held at Pittsburg on Monday evening, Feb. 2. An able paper entitled, "Gates and Sprues," was presented by B. D. Fuller, of the Westinghouse Electric & Mfg. Co. It resulted in considerable discussion and some interesting points were made relative to the casting of sand and chill rolls. It was stated that an 18 or 20-ton roll is poured in a trifle less than one minute, the fast pouring of the metal causing it to swirl inside of the mold, thereby carrying all of the dirt and slag which pass the gates to the top. It was further stated that some twenty years ago an enterprising Pittsburg roll founder secured a patent on the method of swirling the iron inside of the mold and that another roll maker in the district, in order to avoid an infringement of the patent, had a man stand over the mold while the iron was being poured, with a long pole, which was whirled around in the metal for the purpose of producing a swirling motion. Still another foundryman stated that he remembers the time that in casting rolls one man was engaged in churning the iron in the mold with a green pole causing it to boil violently and thus bringing the dirt and impurities to the top. It was also stated that in casting car wheels very little time must be lost in getting the metal into the mold. In casting a 700-pound wheel requiring about 900 pounds of metal about 10 seconds is consumed in getting the metal into the mold. This fast pouring in this case also has the tendency to carry the dirt to the top and out of the mold. The following were present:

Chas. Winder, Westinghouse Electric & Mfg. Co.
D. J. Thomas, Sterritt-Thomas Foundry Co.
E. A. Kebler.
Wm. Yagle, Wm. Yagle & Co.
L. E. Dunlap, Mackintosh-Hemphill & Co.
John Schick, Westinghouse Air Brake Co.
Chas. W. Townsend, Thos. Carlin Sons Co.
Robert Nichols, Pittsburg Plate Glass Co., Creighton, Pa.
Mr. Farnum, Whiting Foundry & Equipment Co.
E. D. Frohman, S. Obermayer Co.
B. D. Adams, Hydraulic Machine Co.
W. J. Reardon, Westinghouse Electric & Mfg. Co.
H. J. Dorsey, Enterprise Foundry Co.
Fred Baur, Enterprise Foundry Co.
Jno. F. Birch, Pittsburg Malleable Co.
B. D. Fuller, Westinghouse Electric & Mfg. Co.
George Niehaus, Westinghouse Electric & Mfg. Co.
G. A. Bauman, Jones & Laughlin Steel Co.
C. F. Knowlton, Westinghouse Electric & Mfg. Co.
Samuel F. Warren, Pennsylvania Malleable Co.
A. V. Slocum, Keystone Car Wheel Co.
Edgar G. Seaman, S. Obermayer Co.
Mr. Schade, Braddock Mfg. Co.
J. S. Malone, J. S. McCormick Co.
Mr. Velte, Veyte Foundry & Machine Co.
George Phillip Maury, The Metallurgical Laboratory.
A. O. Backert, *The Iron Trade Review.*
S. W. Hay, Whiting Foundry & Equipment Co.
F. H. Zimmers, Union Foundry & Machine Co.

The paper of the evening follows:

Gates and Sprues.

BY B. D. FULLER.

The subject, while an interesting one, is rather difficult to talk upon in an entertaining way, as the gating of each individual job must be arranged irrespective of any other. There is no part of the making of a mold in which a man can show his ability so readily as in the gating. When a new job arrives and we go to look over the pattern, the first thing that comes to mind is, How shall we gate it? Many a casting is lost because the molder, like the old woman who lived in a shoe, "didn't know what to do."

There is a large slice of wisdom in the advice given to an apprentice by a son of the Emerald Isle, who was acting as foreman when he said, "Me bye, if yez waahnt to make good castings, yez must ram gintly, vint thourrhoughly, and duve-tail yur gates.' And because of not following this advice, especially as to dove-tailing gates, many a casting goes to the scrap pile. For instance, I have in mind a pattern for a coping used to cap off a stone wall. This pattern was shaped like the side and top or roof of a wall-tent. It was not feasible to force all the iron from the bottom gate, the casting being very light, and from its shape the consequent strain upon the mold was very great, to say nothing of the difficulty of running when thus gated. At the first line of parting, or at the bottom of the roof slope, was a sharp beading of sand running the full length of the pattern, which made this undesirable as a place of gating, as the iron striking this beading caused washing or cutting away of the sand. Along the highest point, or as I might say for illustration, the peak of the roof, were cast in a row of wrought iron spikes in such a manner as to prevent the placing of "pop gates," or top pouring gates. The mold was made in three parts, the cope line being about 4 inches below the highest point of pattern, on this parting the gate was cut.

The casting being poured double, a runner was cut the full length on either side, and about 6 inches back from the pattern, sprues were cut from these runners to the casting, about 3 inches apart. Now what I wish to illustrate is this: The molder cut the sprues deeper at the back, or where the iron was to leave the runner, than where they connected with the casting, thereby causing the metal to choke at the point where the mold was least able to resist the pressure, for, owing to the shape of the pattern, there was very little support underneath the gate. When the mold was poured, the pressure coming upon this weak point, caused the breaking down of the gate and loss of the casting. This trouble was entirely obviated by reversing the shape of the sprues, cutting them smaller at the back, gradually widening and deepening toward the casting, with a slight dove-tail at the finish, this keeping the pressure back in the runner and allowing a free and yet gentle flow of iron to enter the mold. No further trouble was experienced from gates breaking down.

For another example of improper gating, take a plate 14 to 16 inches square 3-32-inch thick, with a hole 3 inches in diameter in the center. Now to cut a runner along each side, with sprues leading in from the runners to the casting about 2 inches wide, with a space of 1 inch between, as would ordinarily be done in casting double, would make your gates heavier than the casting, and they would also contain the hotter and more fluid iron. In cooling, the casting would set first, and be drawn out of shape by the later contraction of the gate. Suppose that what is known as a bridge gate be used, by which I mean an ordinary flat gate, with a semi-circular piece cut out of it to bridge over the parting, forming the hole in the casting. Suppose also that after casting, when the iron is sufficiently chilled off, we take a hammer and tap the gate sidewise, breaking it off, thereby leaving the casting without any gate attached to it, and then after shaking out the casting, stand it on edge to cool, the result will be a straight casting, provided the mold has been properly rammed so that the casting may be of even thickness. Another advantage is that with this gate we can pour single.

As another example, take what is known as the end bracket for brushless motors. It is a circular casting 6 feet outside diameter, having heavy hubs in the center, in which are the bearings for the armature shaft. Around the outer rim are bosses, where the bracket is bolted to the field casting, while the part between the rim and hub is principally composed of light checker work or grating, so made for the purpose of ventilation. In gating this upon the rim, the iron must flow first down and inward to the center; and while the heavy hub is filling, the metal is slowly moving upward and outward amongst the grating. Thus cold seams are formed. But if what is known as horn gates are used, reaching from outside the circumference of the pattern underneath to the hub, thus filling the heavy center first, the balance of the mold is filled rapidly and cold seams avoided.

The foregoing examples all relate to a lighter class of work; but errors in gating are sometimes made whereby heavy and expensive castings are lost, and such an instance I have in mind. The casting was a large spider or armature core, weighing in the neighborhood of 16 tons. The hub, which was very heavy, was connected to the inner circumference by web-shaped arms. The inner circumference was joined to a wide flange top and bottom, and around the outside was a row of teeth connecting with the flange, top and bottom and center, resembling a shrouded gear-wheel, except that there was a space between the teeth and inner circumference for

ventilation. The casting in question was gated through the inner core to the bottom of the hub. Thus the lower part of the hub was first filled. Then the bottom web of the arm received the iron. Traveling along this it reached the inner circumference, then dropped to the bottom flange; next the teeth filled slowly to the center. By this time the iron in the teeth had become sluggish, due to the distance it had traveled and the time taken to reach this point. Now the iron stopped moving in the lower half of the circumference, and the teeth and upper half of the mold were filled by a flow directly from the arms through the center web, connecting the inner circumference and teeth. When the casting was cleaned off, a line of cold seams was found running horizontally through the center of each tooth, just where the iron in the lower half of the teeth had been met by the flow through the center web. This defect was remedied in the next casting by placing gates at the bottom of the circumference as well as through the center core, thus allowing all parts to fill equally.

Next let us take a large dynamo bottom field. These are cast with the light frame or bed part of the casting up, while the extremities of the heavy yoke or field extend down deep into the floor, and at either end of the frame are the legs on which are the bearings for the armature shaft also reaching down lower into the floor. It is not practical to fill this mold from the top, thus allowing the large body of iron to rush downward, hither and yon, through the mold. The procedure is rather to place two down gates outside of the mold at opposite corners, and connect these with draw-in or covered gates to the extremities of the yoke and bearings. Now as you ram up, place a draw gate from the center of the down gate, extending upward to a point on the frame. This will help to run the lighter frame or upper part of the casting after the bottom gates have ceased to take iron freely, owing to the pressure of the body of metal in the mold; while the upper slant of this draw-gate will prevent its taking iron too soon, or until the iron in mold has reached the proper level.

Many and various forms of gates are used in the foundry, each with its specific use—the flat gate, the horn gate, the skimming gate, etc. As to the skimming gate, the old fashioned No. 6, when properly used, is reliable. In using this the sprue should be cut at such an angle that the iron, in its swirling motion, will pass the sprue, carrying the dirt and dross with it, and lifting it up into the head placed to receive it. This represents the principle used in casting rolls, where the gates are so placed as to cause the iron to form a whirlpool in the mold, thus carrying the dross to the center, and allowing it to rise up in the sinking head on the top of the mold.

Another excellent form is the tea-pot gate, where the metal must find its way down through the basin of the gate and thence upward through the spout to the sprue, allowing the dirt to remain in the top of the reservoir. The uses of the horn gate are manifold, but one example will suffice, that of an armature bushing. It is not good practice to pour this from the top, owing to the sharp bed of sand on which the iron would beat, this causing it to cut or wash away; but by filling the mold from the rim with the aid of the horn gate this is prevented.

I might go on from this to a discussion of the sinking head, riser, runner box, etc.; but as the subject is gates and sprues, and I do not wish to become tiresome, I will "stick to the text," simply calling attention to one defect very often met with in the cutting of a runner in the runner box or on top of the mold. We frequently see a runner cut deep at the bowl or pouring end, and rising from this point to the gate stick. This is a mistake, as when the iron is started from the ladle and the bowl of the gate fills up, the dirt will gather on top of the runner and gradually approaching the down gate, it being the highest point of the runner and consequently containing less metal to float it, will roll nicely over the point and down the gate into the casting. Doubtless many of you have often witnessed this. Now, by giving the bottom of runner a downward slant from bowl to gate stick, when the iron flow is started, the dirt will be quickly shot down the runner where it will strike the end and rise; and provided the down gate is disproportionately large, it can easily be kept floating on top until mold is full.

Gates and sprues protruding from castings are often very unsightly. I once had a gentleman in an official position ask me if I could not make castings without gates. Now I have seen molds poured when the result was gates without castings, the molder having forgotten to cut the sprues; but I have not yet seen castings made without gates, except when in the form of open sand molds. Perhaps some of the gentlemen present can enlighten us upon this point.

Statement of the Virginia Iron, Coal and Coke Co.

The governing committee of the New York Stock Exchange, has decided to admit to quotation on the exchange the exchange the securities of the Virginia Iron, Coal & Coke Co., as follows: $8,641,600 capital stock and $6,993,000 first mortgage 5 percent fifty-year coupon bonds of 1949. Accompanying the application was a statement giving a history of the company, which was organized Jan. 19, 1899. It was in the hands of receivers from Feb. 6, 1901, to Jan. 1, 1903, when the receivers were discharged. The balance sheet as of Jan. 1 was as follows:

DEBITS.

Real estate and plant		$17,771,139
Equipment account		79,919
Sales, ledger balances		844,439
Sundry bills, ledger balances		14,506
Open accounts		29,377
Bills receivable		135,311
Advances to cashiers		15,902
Cash balances, commissaries		2,253
J. W. Cure, treasurer		35,221
Stock of raw material on hand:		
Pig iron	$60,305	
Other products	34,076	
Raw materials	294,097	
Supplies	167,194	
Merchandise	117,041	
Farm products	13,545	
		686,258
		$19,614,383

CREDITS.

First mtg. bonds, Va. I. C. & C. Co. outstanding		$9,967,000
In hands of Manhattan Trust Co:		
To retire prior liens	$ 829,000	
In hands of company	1,835,000	
		2,664,000
		$7,303,000
Bonds outsanding		$8,057,500
Stock outstanding		10,000,000
Unpaid vouchers and pay rolls and accounts payable		300,464
Taxes accrued		5,286
Fund for depreciation coal ore land and furnace repairs		343,674
Accrued profits		907,459
		$19,614,383

Growth of the International Steam Pump Co.

A circular issued by the officers of the International Steam Pump Co., to shareholders with reference to the recent issue of debenture bonds says that the net profits of the past three years have averaged 6.95 percent on the common stock after all deductions for sinking fund, depreciation, etc. "The growth of the business has so far exceeded expectations that it has become necessary to greatly enlarge and concentrate its existing plant and to build new factories to meet the changed conditions and provide for further extensions. The volume of business for the year ended Oct. 31, 1902, is about double the amount of business of the constituent for the year ended at the formation of the company. On Oct. 31, 1902, there were $5,686,067 of orders in hand. A tract of land has been purchased and work begun on a plant at Harrison, N. J., which will be by far the largest pump works in the world. The works of the Snow Company at Buffalo are being changed and enlarged with the view of concentrating a large part of the water works business at that point, and the capacity of the Blake factory is also being increased by the erection of a new factory and equipment. For these purposes, as well as to provide funds to pay for improvements already made, for which the company has temporarily borrowed about $700,000, the directors have authorized an issue of $3,500,000 debentures. It is intended to issue not exceeding $2,500,000 of these debentures at this time and then only from time to time as the money is needed."

A meeting of the executive committee of the Blast Furnace Workers' Union will be held at Youngstown, O., on Feb. 18, for the purpose of fixing a date for the enforcement of the 8-hour day for all blast furnace workers.

A STRIKE AGAINST THE PREMIUM PLAN.

The strike that has been in progress recently at the Payne Co.'s engine works at Elmira, N. Y., involves a modification of the premium plan. The company on Dec. 26, 1902 posted the following notice:

To the Employes of Payne Co.:

Inasmuch as the present working of the blanket premium plan is not giving satisfactory results either to the company or employes, the company proposes to compute and pay premium to the individual workman based upon his product, as soon as the schedule can be arranged, so that each man may profit by his personal effort.

In the conduct of the system, the following conditions will be strictly carried out:

First—Each employe shall receive his regular hourly wage.

Second—In addition thereto he shall receive a premium at his regular hourly rate on one-half the actual time saved by him in doing the work, between the allotted time and the actual time consumed.

Third—The time charged to a premium job must be the actual time from start to finish of the job.

Fourth—No premium shall be paid for defective work.

Fifth—All premiums will be paid within two weeks from acceptance of work on which they are earned.

Sixth—No change will be made in the schedule time allotted for the different operations, except as improved methods may be introduced.

Seventh—There shall be no limit on the amount of premium any employe shall earn and receive.

Respectfully,

PAYNE COMPANY.

In a public statement commenting on the above and on the strike, the Payne Co. says:

"Prior to publication of this notice, a blanket premium of one-half the reduction in labor cost of manufacture in each order was distributed among all the men engaged in the production thereof. The result was that inasmuch as the good workman and the inferior workman received the same proportion of the premium, the good man had no incentive to increase his product as the gain upon the particular order was shared by both alike. The present aim, therefore, is to establish a premium system by which each man shall be compensated according to his individual effort. It is not a system of piece work; every employe is guaranteed the standard market price for his labor in any event.

"A workman may or may not take advantage of the proposition, as he sees fit. If he desires to continue to work at the ordinary rate of production, he receives the standard prevailing rate of wages, but an opportunity is afforded to increase his wages from 25 to 40 percent by exercising his mental faculties, so as to increase the production of his machine. There is nothing compulsory about the premium plan. It is simply an effort to reduce the cost of production and simultaneously increase the wages of the workmen. The opposition to this system arises from an effort to bring all workmen good and poor to the same level. Some of our leading competitors are using this plan with good results to both the employes and the employer. We cannot compete in the open market unless we can adopt the improved methods of our competitors."

The Carnegie Steel Co., American Steel Hoop Co., and the American Bridge Co. have established a joint agency with Henry Jones as general agent at Sydney, N. S. W. The office address is 14 Martin Place. Mr. Jones was formerly connected with the general sales department of the Carnegie Steel Co. in the Philadelphia office.

New York newspapers state that officials of the United States Steel Corporation have announced that the net earnings for the month of January will be much larger than the estimate of $8,000,000 for December. The January figures are said to exceed $9,500,000, as compared with $8,900,000 last year. The production will be larger this year than last year. Officials estimate that the net earnings for the year will exceed $145,000,000.

NICKEL STEEL FOR RAILS AND SPLICE BARS.

An interesting development in the rail situation recently, has been the marked attention railroad companies have given to the question of lessening the cost of maintenance of their road beds. This is particularly true of rails and angle splice bars, the cost of the installation and maintenance of which has considerably increased during the past five years, partly because of more exacting specifications, and also because of the heavy increase that has taken place in the weight of rolling stock. For example, the average steel car is now made to carry from 100,000 to 125,000 pounds, and the weights of locomotives are in proportion.

After a great deal of investigation and experimenting, the railroads have discovered that excellent results are derived from the use of nickel steel rails, particularly where the service is heavy, as on curves. Acting on this demonstration some large orders have been given for nickel steel rails to the Carnegie Steel Co. Among them are orders for 8,000 tons by the Pennsylvania Co., 3,000 of which will be installed on its Western lines, and an order for 1,000 tons by the Baltimore & Ohio Railroad. The Carnegie company has also been given orders for the angle splice bars, which go with the rails, and which will be made of nickel steel also.

The rails will be after the usual rail steel specification, plus 3¼ to 3½ percent nickel. Owing to the toughness and hardness of the nickel steel, the drilling will take considerably longer than the drilling of the ordinary steel rail. The angle splice bars will be of the usual mild steel, plus 3¼ to 3½ percent nickel. The cost of nickel rails and splice bars is estimated at about twice as much as the ordinary steel rails, but the expectations are that they will last from three to four times longer, fully justifying the increased expenditure. From inquiries received it would appear that other railroads will give similar orders in the near future.

A Book on "Manufacturers' Accounts."

The authors, Wilton C. Eddis and William B. Tindall, have taken up the highly important question of manufacturers' accounts and in a cloth-bound volume of 181 pages, about 8½x6 inches, discuss it with skill and discrimination. The treatment might easily have covered a wider field and the book taken on corresponding size but the matter has been compactly put, rather illustrating the principles involved than attempting the preparation of a series of methods which should cover in detail a variety of businesses. The subject is treated broadly, however, to the extent of illustrating the general scope and purpose of the system, and the authors have not been unmindful of the manufactory where it may be impracticable from the amount of detail work to apply the methods which may well serve in another place. Here the course has been pursued of presenting cost accounts of a readily applied character, such as would entail a minimum amount of bookkeeping. Added value is given to the work by the practical arrangement of the forms—the machinery of cost accounting—and here the book is particularly strong. Over seventy of the pages are covered with illustrations showing the methods as applied in the accounting work of boiler and engine manufacturers, contracting engineers, etc. The text is in no wise inferior to the illustrations and the authors have candidly expressed their opinion upon many of the points often held to be debatable. An excellent feature of the work is the index. The chapters have been summarized consecutively and the forms and subject matter have independent indices permitting a ready means of reference either to the general topic of any chapter or any single item. The book is published by the authors at 23 Toronto St., Toronto, Ont. Price $3.

The Ohio plant of the National Steel Co., at Youngstown, O., resumed operations this week after a shut down of about two weeks. The three furnaces at the plant which were banked for a period of ten days have also resumed operations.

Injunction With Novel Features Against Structural Workers.

The trouble at the Isabella Furnace, Etna, Pa., was the subject of an application for an injunction which was granted at Pittsburg on Jan. 28, in the common pleas court, by Judge Elliott Rodgers to the Brown Hoisting Machinery Co., of Cleveland, against Local No. 3, International Association of Bridge and Structural Iron Workers, and others. It originated in an attempt to prevent the regular workmen of the Brown Hoisting Machinery Co from doing any work at Etna, or in the territory claimed to belong exclusively to the union.

As far back as September last, the Brown Hoisting Machinery Co., being under obligations to build outside movable bridge tramway structures, sent its regular corps of expert men to put up the structure. Immediately upon their arrival they were interfered with and compelled by the members of the union and others to leave the premises of the Isabella Furnace Furnace Co., and were threatened with violence in case they returned to work. For this reason the Brown company was compelled to suspend its operations for several months. It then became necessary to attempt resumption of work, whereupon the same process of intimidation was resorted to by the members of the union and others, and severe and actual assaults were committed on the men at work. It was not a case of strike, nor an attempt on the part of the Brown company to interfere with the work of other parties, or to supplant or supply the places of other men. In addition to this there was absolutely no trouble at any stage of the proceedings between the Brown Hoisting Machinery Co. and its own men; but from the beginning the men who were employed by the Brown company were those who had done similar work for it for years.

The broad issue raised by this state of affairs was the contention by the bridge men's union that no one without their permission should be allowed to work in Pittsburg or within a radius of 135 miles. This position the Brown Hoisting Machinery Co. considered wholly untenable both in justice to themselves and their employes. Under the circumstances the company was compelled to resort to the court for an injunction, and after a full hearing the court allowed it, and the injunction has been issued and posted accordingly.

The case is one of the most aggravated attempts yet made by a labor union to dictate both to an employer and his satisfied employes the conditions under which they shall carry on a work with which the interfering union has never had anything whatever to do. In order to prosecute the work at Etna the Brown Hoisting Machinery Co. has been compelled to surround the plant with armed guards and to build a camp or barracks for its men on the premises; equip this camp with cots and bedding; also to provide cooks and waiters and an entire commissary department, and keep its men continually on the premises.

One of the attentions the company has received from the union was the distribution of the following circular among its employes at the Cleveland works as they left the shops on Saturday, Jan. 31:

"AN APPEAL TO LABOR.

"The Brown Hoisting Machinery Co., of Cleveland, Ohio, has declared war on the Structural Iron Workers' Union of Pittsburg, and has resorted to that un-American method of enslaving its employes—the injunction,—discharging several of its old and faithful employes for refusing to work under the protection of an armed guard and to live in hovels which the company has built at the plant of Isabella Furnace at Sharpsburg that are unfit for human beings to dwell in on account of their reeking with vermin, thereby exposing the occupants to smallpox, fevers, etc. Is it any surprise, therefore, that anyone with the least spirit of manhood would revolt at such conditions?

"Fellow workers, over 300,000 men who gave up their homes and lives now lie under the sod in Southern battlefields to obliterate just such a system of bondage as this! And now, in these times of prosperity and enlightenment, men are driven like hogs into pens reeking with filth and disease.

"Brother workmen, we have been quarreling among ourselves long enough; let us be friends and demonstrate our confidence in each other by refusing to work for the Brown Hoisting Machinery Co., of Cleveland, Ohio, until they have recognized the union bridge builders of Pittsburg. You have been tools for them, and every blow that they have struck against organized labor is a blow at the spirit of freedom and a step toward industrial slavery.

"And now, our Cleveland brethren, we appeal to you to stay away from the erection work of the Brown Hoisting Machinery Co. at Etna, and some day you may appeal to us, and we assure you it will not be in vain.

"UNITED WORKMEN OF PITTSBURG."

Text of the Injunction.

The injunction granted by the Allegheny County court differs in some respects from any we recall. It will be noticed that publication, so far as the union is concerned, is to be by "posting and printing in prominent places in the vicinity of the premises," and that in addition to the defendants it is binding upon "all other persons whomsoever, from and after the time they severally have knowledge of the allowance of this order." The text follows, omitting the titles and preliminary clauses:

"It is hereby ordered, adjudged and decreed that the Bridge and Structural Iron Workers' Local Union No. 3, J. P. Kelly, President; W. C. Bennett, Secretary; James Coakley, Business Agent; Thomas Dunn, M. Flaherty, D. Tobin, Charles Phillips, James O'Brien, John Murray, George Boyd, R. McLean, and M. Gallatine, members of the Executive Committee of said Bridge and Structural Iron Workers' Local Union No. 3, as well as all of the other officers thereof, and all of the members thereof, and each of them, and James Coakley, W. C. Bennett, J. P. Kelly, Thomas Dunn, M. Flaherty, D. Tobin, Charles Phillips, James O'Brien, George Boyd, R. McLean, M. Gallatine, H. W. Gillen, Patrick Fahey (or Fay), William Finnegan, Harvey Hermes, Mike McGraw, William Waggoner, Frank Hughes, Thomas Kane, and Charles Schoop, as individuals, and each of them, is and are ordered, commanded, and enjoined to desist and refrain from in any manner impeding, hindering, obstructing, or interfering with any of the business of the complainant in the performance of its contract in the furnishing of material and erection at the plant known as the Isabella Furnace Company Plant, in Etna Borough, Allegheny County, Pennsylvania, of bridges to be used for the transportation of iron ore and other material, and from entering upon the grounds or premises of said plaintiff company at which or upon which it is to perform its said contract and do its work, for the purpose of impeding in any manner whatever its business or interfering therewith.

"And the said defendants are, and each of them is, also ordered, commanded, and enjoined from compelling or inducing, or attempting to compel or induce, by the use of threats or intimidation of any sort, or fraud or violence, any person to leave the employment of said plaintiff company or not to enter its employ if so desiring; and from doing any act or thing whatsoever by any of the aforesaid means or methods in furtherance of the purpose to impede the business of said company, or impede any of its officers or employes in the free and unhindered conduct and control of said company's business.

"And the said Bridge and Structural Iron Workers' Local Union No. 3, its officers and the members thereof, and the said individuals, defendants above named, are and each of them is ordered, commanded, and enjoined to desist from congregating at or near the premises of said company, situate in the Borough of Etna, Allegheny County, Pennsylvania, occupied or used by said complainant company, with the purpose and in such manner as to intimidate or obstruct, surround or impede, in any manner, by collecting for that purpose to intimidate, any of the employes of said plaintiff company, or persons seeking employment from it, in going to, remaining on, or coming from said premises occupied by said plaintiff company.

"And the said Bridge and Structural Iron Workers' Local Union No. 3, the officers and members thereof, and the said individual defendants, are, and each of them is, hereby enjoined and forbidden, either singly or in combination with others, from picketing, guarding, obstructing, impeding, besetting or patrolling the streets, alleys or approaches to the premises of said company, or ordering the same to be done, with the purpose and in such manner as to intimidate, threaten, impede, obstruct, surround, or coerce any of the employes of the said plaintiff company, or persons seeking employment with it; and the said Bridge and Structural Iron Workers' Local Union No. 3, the officers and members thereof, and all of the said individual defendants herein named, are, and each of them is enjoined from in any manner interfering with such persons in going to

or from, or remaining at the premises or place where said complainant company is to perform its contract and doing its work, and from interfering with any such persons anywhere because of such persons being in the employ of said complainant company, or of their seeking to be employed by it, by intimidation, threatening impeding, surrounding or coercing them.

"And the said Bridge and Structural Iron Workers' Local Union No. 3, the officers and members thereof, and the said individuals above named, are and each of them is enjoined and restrained from going or directing any one to go, either singly or collectively, to the homes, boarding houses or other places of habitation of the employes of complainant company, or any of them, or of persons seeking their employment, with the purpose of intimidating or coercing any or all of them to leave the employment of said complainant company, or from entering plaintiff's employment.

"And it is further ordered that this order and decree shall be in force and binding upon the Bridge and Structural Iron Workers' Local Union No. 3, and all the officers and members thereof from and after service thereof; and shall be binding upon each and all the other defendants named in the bill, from and after service; and shall be binding upon each of the members of said Bridge and Structural Iron Workers' Local Union No. 3, from and after publication thereof by posting and printing in prominent places in the vicinity of the premises in Etna Borough, Allegheny County, where complainant company is performing its contract; and shall also be binding upon all the defendants and all other persons whomsoever from and after the time they severally have knowledge of the allowance of this order."

The Fire Brick Consolidation.

Options have now been secured on nearly all of the independent fire brick and silica brick plants independent of the Harbison-Walker Refractories Co., of Pittsburg, and the proposed consolidation of these interests is now progressing towards a successful consummation. The new company is to be capitalized at $15,000,000 and according to present plans all the plants are to be purchased outright. The Colonial Trust Co., of Pittsburg, will act as trustee. The options thus far secured will not expire until the last week in April. Options have already been secured on the following plants: Niles Fire Brick Co., Niles, O.; Dover Fire Brick Co., Cleveland, O.; Davis Fire Brick Co., Oak Hill, O.; Sciota Fire Brick Co., Sciotaville, O.; Reese-Hammond & Co., Bolivar, Pa.; Garfield Fire Brick Co., Bolivar, Pa.; Lincoln Fire Brick Co., Bolivar, Pa.; Joseph Soisson Fire Brick Co., Connellsville, Pa.; Dunbar Fire Brick Co., Dunbar, Pa.; Stuart Fire Brick Co., Layton, Pa.; Delaney Fire Brick Co., Fairchance, Pa.; W. H. Wynn & Co., West Decatur, Pa.; Sandy Ridge Fire Brick Co., West Decatur, Pa.; Queens Run Fire Brick Co., Lock Haven, Pa.; Renovo Fire Brick Co., Renovo, Pa.; Pennsylvania Fire Brick Co., Renovo, Pa.; Burns Fire Brick Co., Williamsport, Pa.; South Fork Fire Brick Co., South Fork, Pa.; Ohio Fire Brick Co., Oak Hill, O.; Climax Fire Brick Co.; Red Bank, Pa.; Savage Fire Brick Co., Hyndman, Williams Station and Keystone, Pa.; Elk Fire Brick Co., St. Marys, Pa.; Gardner Bros., Cumberland, Md.; Savage Hill Fire Brick Co., Fair Hope, Pa.; Eureka Fire Brick Co., Mount Braddock, Pa.; Mount Union Fire Brick Co., Johnstown, Pa.; Pennsylvania Silica Fire Brick Co., Pittsburg, Pa.; West Branch Fire Brick Co., Renovo, Pa.; Maxwell, Gloninger & Co., Williams Station, Pa.; Welch, Gloninger & Maxwell, Monaca, Pa.; Ashland Fire Brick Co., Ashland, Ky.; Parker & Austin, Ironton, O.; and three other companies recently taken over by the Ashland Co.; Olive Hill Fire Brick Co., Kentucky.

An interesting paper weight has been received from the Allis-Chalmers Co., of Chicago. It is a cast iron souvenir of the first heat taken off at the foundry at the West Allis Works at Milwaukee and is about 5 inches long. A couple of 1½-inch holes have been bored through the upper surface and these contain bronze medallions of Chief Engineer Edwin Reynolds and of the mammoth works at West Allis.

PERSONAL.

John W. Lees, superintendent of the Newburg (Cleveland) rolling mill of the American Steel & Wire Co., has resigned to accept the position of superintendent of the rolling mills of the Inland Steel Co., Chicago Heights, Ill. Last Saturday, in the presence of the superintendents of the different departments of the works and of 500 employes he was presented a diamond stud as a testimonial from the employes and his business associates. The duties of E. Bayard, superintendent of the Bessemer department, will be extended to include the superintendency of the blooming and billet mills, of which Mr. Lees was superintendent.

J. D. Dwyer,, superintendent of the rolling mill department of the Southern Car & Foundry Co., Anniston, Ala., has resigned, and has accepted the position of superintendent of the rolling mill of the Louisville Nut & Bolt Works, Louisville, Ky. Mr. Dwyer has been succeeded by John Reese, who has been connected with the Anniston plant of the Southern Car & Foundry Co. for a number of years.

C. D. Rogers, of the Rogers Screw Co., Providence, R. I., has gone on a Southern trip for the benefit of his health.

Edward L. Leeds, of London, one of the European representatives of the Brown Hoisting Machinery Co., Cleveland, has sailed for Europe, after a short visit to this side, but will return to the United States at an early date in connection with some important contracts which have been secured for Brown machinery to be installed in British plants.

George H. Gibson has resigned his position with the Westinghouse Companies' Publishing Department, of Pittsburg, to accept a position with the B. F. Sturtevant Co., of Jamaica Plain Station, Boston, the well-known manufacturer of blowers, heating, ventilating and forced-draft apparatus, electrical machinery, and steam engines. Mr. Gibson was formerly a member of the editorial staff of the *Engineering News*, and is a graduate of the engineering school of the University of Michigan.

Capt. J. W. Woolfolk, who has been general manager of the Woodstock Iron Works, Anniston, Ala., for the past two years, has resigned, to look after his own large business interests.

Henry McHarg, Jr., son of President McHarg of the Virginia Iron, Coal & Coke Co., is now working as a laborer at one of the furnaces of the company at Roanoke, Va. He is a college graduate and is now working to get practical knowledge of blast furnace operations.

R. H. Lee has resigned charge of the blast furnace department of the Colorado Fuel & Iron Co. and has become manager of the Middlesboro, Ky., furnaces of the Virginia Coal, Iron & Coke Co.

E. H. Symington, M. E., has resigned as assistant superintendent and mechanical engineer of the Kilbourne & Jacobs Mfg. Co., Columbus, O., having been in charge for the past two years of a new central station electric power installation and other improvements. He will go into the railway supply business with the firm of T. H. Symington & Co., Baltimore, Md. Mr. Symington was formerly assistant master mechanic of the Sayre, Pa., shops of the Lehigh Valley Railroad.

Henry B. Shields, formerly active in the Mahoning and Shenango Valleys and allied with many industries there in the past, is lying seriously ill at his home in New York.

James A. Blair has been elected a director of the Pressed Steel Car Co., of Pittsburg, to succeed H. B. Moller who resigned recently.

The question whether the making of pig iron is to be continued at the penitentiary at Rusk, Tex., is arousing much discussion in that state. A bill appropriating $75,000 for the improvement of the plant has been introduced in the legislature, and its author claims that charcoal pig iron can be made at $9 per ton and sold at $18. Opponents of the bill claim that the proper cost charges have not been made by the superintendent of the penitentiary, and that making of iron is not as profitable as the figures indicate. The blast furnace is banked at present on account of being unable to get a supply of ore.

LETTER FILING SYSTEM OF THE MARYLAND STEEL CO.

Filing letters so that they may be had promptly, when necessity dictates, is one of the most important time-saving factors in any business enterprise of a progressive character. The office of the Maryland Steel Co., at Sparrow Point, Md.,

FIG. 1.—THE VERTICAL FILING CABINET.

has put in recently a very complete system for handling correspondence which will be of interest to many. The system described below is similar to the one installed, but a few modifications have been made in the hope that it may be fitted for a greater scope and elasticity and thereby meet the demands of many other firms.

FIG. 2.—FOLDERS FOR VERTICAL LETTER-FILING.

The advantages of the plan proposed are many. An important one is that there is no limit to its capacity. A name once indexed need never be indexed again. The long waits which accompany the necessity of hunting up previous correspondence with some firm or another are done away with. After a letter is once indexed, all succeeding correspondence with that firm falls naturally into its place.

First, a cabinet similiar to Fig. 1 and an ordinary card index are procured. As will be seen from Fig. 1, the cabinet in which the letters are filed is a series of deep drawers, into which fit folders, open side up, like closed books, resting on their backs. Into these the letters are placed as in Fig. 2, and

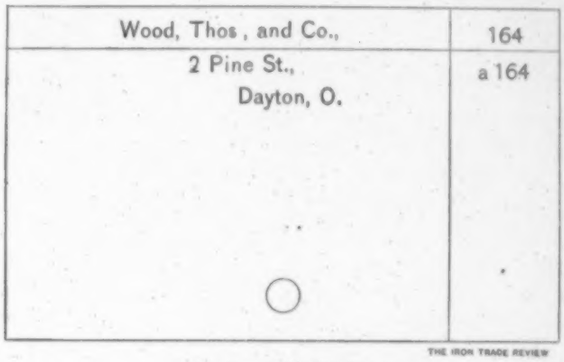


FIG. 3.—CARD INDEX.

the correspondence can be read over very much as one would read an ordinary book.

On the top inner edge of the folder, which is about half an inch higher than the front side of the cover appears the firm name and a number relating to the correspondence to be found in that folder. These folders are arranged numerically. Each firm with which any communication has been had, is given a card, Fig. 3, in the index, which refers to the number of the folders. This number is permanently attached to that particular firm.

Where it is desired to keep a certain class of correspondence

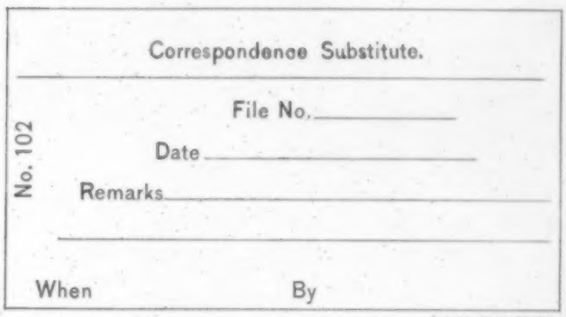


FIG. 4.—CORRESPONDENCE SUBSTITUTE.

separate, such as bills, or letters relative to quotations, etc., another folder immediately follows the original folder, in which the regular mail is to be found, or they may be filed in an entirely separate part of the cabinet. In either case it is well to have the folders for the regular mail, say, cream, and the folders for the bills pink, etc., This establishes a slight distinction, which can be readily seen.

These second folders of each firm, have the same numbers as the regular mail have, except, that the number has a different letter prefixed in each case. Fig. 3 shows this very plainly as the "164" is the number of the regular correspondence, and the "A164" would be the number of that folder of the same firm's correspondence, which would be kept separate, as quo-

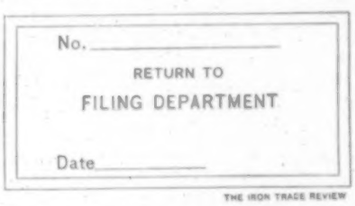


FIG. 5.—FACSIMILE OF RUBBER STAMP.

tations or invoices, etc. "A" would be understood to represent, say, quotations, and "B" bills, etc. In this way by looking at the index card it would be told whether the correspondence is thus subdivided.

Letter press books are not necessary and are best superseded by carbon copies, which are taken of all out-going communications. This amounts to a considerable saving of labor, in copying and indexing letters. These copies are of course filed with the other mail, in their respective folders.

When the mail is received, each letter is marked near the top with its file number. This is done when the mail is opened, so that as soon as the subject matter has received attention it is ready to be filed.

In answering a letter, the file number being on the letter, as stated above, the person dictating the reply will first give the file number, which the stenographer in transcribing will place at the top of the letter. In the case of a first communication, a card in the card index and a folder are made out, with the first available number, as illustrated in Figs. 2 and 3. The lower part of these cards may be used for brief records of the firms represented on them.

It is often of advantage to devote at least one drawer, of the card index to a cross index relative to correspondence for certain classes of goods, or materials with different firms. Thus, the heading of the card is made out, say, for a certain kind of machinery; then below the line will follow the names of the firms with which correspondence has been had, and their folder numbers. This often saves time, where a good many firms are corresponded with, on any one subject of constant interest. If some of the letters, say with Thos. Wood & Co., are signed by John Ward, and perhaps written on a personal letter head, but still relative to business matters, it is well to give John Ward a card in the index, referring to Thos. Wood & Co., folder 164.

It may be well to state that the letters are kept in the folders relative to their dates. Where a great many letters are received from a firm in the course of a year, a folder may be used for every month or so, being marked in plain sight. It is best to transfer the first of each year, so each year's correspondence may be properly assorted.

To aid in locating a folder quickly, an index card is placed between every few folders, giving the numbers of the folders to be found between the indices. If a letter should be given to anyone, for any reason whatsoever, a memorandum is placed in the file in its stead. These memoranda, or correspondence substitutes, are similar to Fig. 4 and are made in duplicate, each part bearing the same number. In this instance the number is 102. Being numbered consecutively, each letter will have a different number, which is given out, and its substitute bearing that number placed in the file in its place. This number is placed on the letter in a space indicated by the use of a rubber stamp on the letter. This stamp is similar to Fig. 5. The letter is then given to the person desiring it and he receipts for same on the original correspondence substitute, which is placed on file in the place of the letter. The duplicate is placed in the "tickler," under a later date, so as each day comes round, it brings its correspondence substitutes to mind and the missing letters may be traced. As the letters are replaced in the file, their substitutes are destroyed.

I consider this system one of the greatest time savers since the invention of the typewriter. S .E .E.

The annual meeting of the stockholders of the Standard Gauge Steel Co., of Beaver Falls, Pa., was held last week, and officers elected as follows: A. Rasner, Pittsburg, president; J. W. Fownes, vice president; J. A. B. Patterson, secretary, and H. F. Dinger, treasurer. S. Moltrup is superintendent. The size of the plant is being materially increased by the erection of a large warehouse in which a large assortment of the steel products manufactured will be constantly carried. A number of new machines including a large shear are also being installed. The output of the plant consists of racks, keys, elevator guides, rounds, flats, squares and cold drawn shafting.

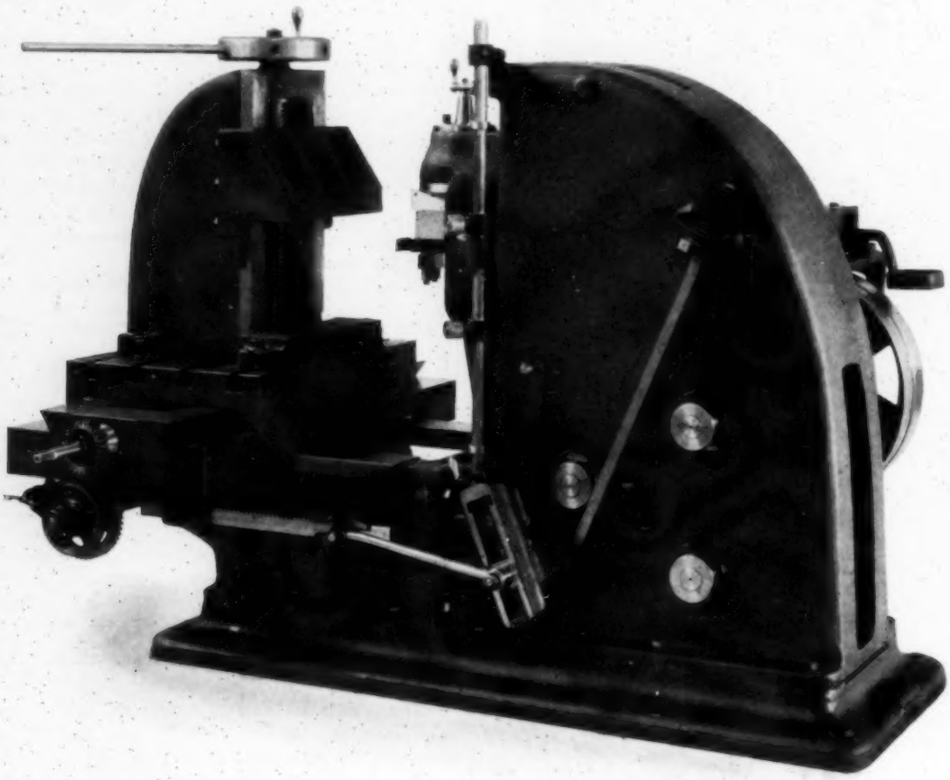


FIG. 1.—THE COLBURN VERTICAL DRAW STROKE SHAPER.

Secretary Bennett H. Brough, of the Iron and Steel Institute, announces that applications for the Andrew Carnegie research scholarships, each of the value of £100, will be received up to Feb. 28, 1903. Candidates must be under 35 years of age and must apply on a special form to the secretary, 28 Victoria St., London, S. W. The scholarship awards of last year were to O. Boudouard, Paris; W. Campbell, New York; A. Campion, Cooper's Hill; P. Longmuir, Manchester; E. Schott, Berlin; F. H. Wigham, Wakefield.

The Cleveland Automatic Stoker Co., recently incorporated, has decided to locate its plant in Toledo.

THE COLBURN VERTICAL DRAW STROKE SHAPER.

This machine is especially adapted for machining such work as cannot be readily handled on an ordinary planer or the regular type of shaper, and wherever it is necessary to remove heavy chips from the toughest metals. This includes squaring up steel die blocks, planing out rolling mill housings, dynamo field frames and cutting the gates and risers from steel castings. It is particularly adapted for squaring up the edges of large plates, and for finishing the ends of long pieces which cannot be handled to good advantage on a regular planer.

The machine shown in Fig. 1 has a table 30 inches long and the same length of feed, but machines can be built on the same principle with tables of almost any length or width. It has not only a draw out, but the ram has a vertical travel and the cut is taken on the down stroke. The thrust is therefore sustained on the solid bed of the machine.

In Fig. 2 a nearer view of the tool is seen in the act of taking a chip 1¼ inches deep with a feed of about 1-16 of an inch and the photograph shows no evidence of the tool jumping or springing where it enters or leaves the work. This shows that the efforts of the designer in the production of a perfect support for the piece to be operated upon as well as the ram, have been very successful and that the tool works throughout the stroke under a remarkably even control. The tool seen at work in Figs. 2 and 3, was made of Novo steel and was run at a cutting speed of 28 feet per minute, which it is claimed can be considerably increased.

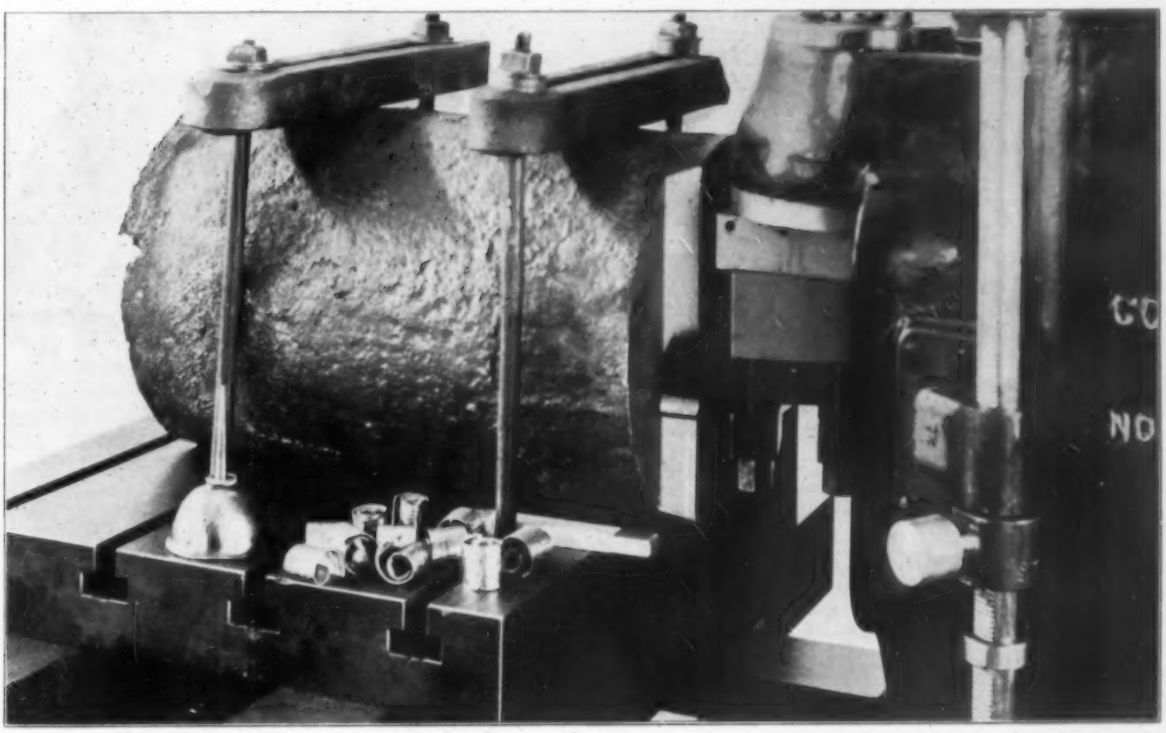


FIG. 2.—THE COLBURN SHAPER TAKING A CUT 1¼ INCHES DEEP AND WITH $\frac{1}{16}$ OF AN INCH FEED, IN A STEEL CASTING.

A lot of chips removed in this manner are illustrated in Fig. 4 and here, as well as in Figs. 2 and 3, a rule has been photographed from which one can readily compare the dimensions. The chips are taken as they drop from the cutting tool in a neat manner; they drop down a sluiceway and from thence pass into a box at the side of the machine, as in Fig. 3. This casing may be readily reversed when a lubricant is employed on the work and the chips are then retained in the box in the base of the machine.

The ram travels in an upright frame of massive construction and has a bearing its whole length. Unlike an ordinary shaper, the ram never overhangs its bearing. The ram is driven by a regular rack and pinion planer motion, having open and crossed belts on the pulleys. The return motion is 2½ to 1. All the gearing is cut from the solid and is extremely heavy, the rack and pinion both being made of steel. The stroke of the ram is regulated by the tappet collars on the vertical rod in front. These can be set instantly for any stroke, without the use of a wrench.

The tool head is constructed somewhat like a planer head. It is graduated for swiveling, can be set to any angle up to 45 degrees either side of the center and is fed in and out by means of ball handle on top. The regular spring clapper box construction is used to keep the tool from dragging on the return stroke.

The table has an automatic cross feed of 32 inches and an in and out hand feed of 17 inches. A powerful clamp locks the saddle to the bed when the cross feed is used. An extra heavy vise is furnished with each machine, and is shown in position in Fig. 1. The jaws are faced with tool steel and are 18 inches wide and 6 inches deep, and open to 16 inches. The upper jaw is moved by means of a large screw 27-16 inches in diameter. All sliding surfaces are scraped to a perfect bearing, all running bearings are bushed and provided with means for perfect lubrication. All gears are cut from the solid, and bevel gears are planed. The sliding table and the saddle are provided with bronze nuts made adjustable for taking up all wear, thus eliminating disagreeable lost motion. The machine is extremely simple in construction; the parts being few and in plain sight.

Some of the advantages claimed for the vertical shaper are as follows: The lines to which it is desired to work can be plainly seen without it be necessary for the operator to stoop over. There is no liability of the work springing, as the strain is always down on the solid bed of the machine. All chips fall down away from the tool and are carried out through a sluice way into a box or receptacle at one side of the machine. They never remain on the piece being machined, thus covering up the finished surface, as on a regular shaper. The workman can practically operate the machine whilst standing in one position. The machine occupies very little floor space.

The main dimensions are as follows: Extreme travel of ram, 26 inches; working length of ram, above table, 22 inches; in and out feed of tool holder on ram, 3 inches; sliding table, 24 inches wide by 30 inches wide; height of sliding table from floor, 29 inches; automatic cross feed of table, 32 inches; in and out hand adjustment, 17 inches; table feeds range, from

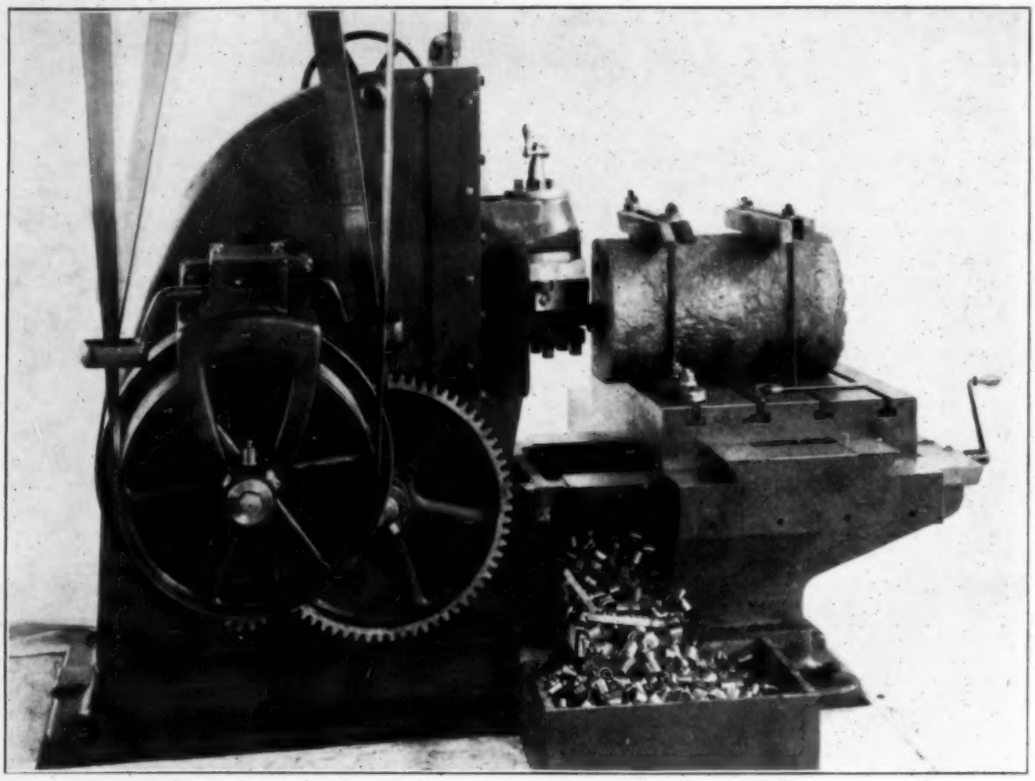


FIG. 3.—REAR VIEW OF COLBURN VERTICAL SHAPER.

1-100 inch to ¼ inch; extreme height of machine, 6 feet; floor space required, 8 feet x 6 feet; tight and loose pulleys on countershaft, 15 inches in diameter for 4½ inch belt; width of up and down belt, 3 inches; speed of countershaft, 360 r. p. m.; weight of machine complete with vise and countershaft, 9000 lbs. The manufacturers are the Colburn Machine Tool Co. of Franklin, Pa.

The St. Mary's Machine Co., St. Mary's, O., is considering several propositions from other cities to move its plant, but has not yet decided to accept any of them. A decision will be made within the next six weeks.

Assemblyman Elijah Cook has prepared a bill for introduction in the New York General Assembly providing for the incorporation of a new city to be known as Lackawanna at Stony Point, the site of the new steel plant of the Lackawanna Steel Co. The company opposes hasty action in the matter, and deep interest is being manifested by citizens of Buffalo, some being in favor of the incorporation of the new city, and others opposed to it.

The Balkwill Pattern Works, 970 Hamilton St., Cleveland, announce that they have added a new department, which embraces the manufacture and design of architectural and ornamental patterns. All the ornamental work will be modeled in clay and furnished in plaster composition, wood, iron, white metal or brass. W. H. Wilkinson will have charge of this department.

The stockholders of the American Car & Ship Hardware Mfg. Co., New Castle, Pa., have elected the following directors: Charles Johnson, Chas. Matthews, Edward S. Whiteling, G. L. Patterson and Robert K. Aiken. The following general officers were elected: President, Charles Johnson; secretary, Charles Martin; treasurer, Thomas Hartman.

FIG. 4.—CHIPS CUT FROM STEEL CASTING BY COLBURN SHAPER.

Cutting Speeds and Motor Drives for Machine Tools.*

BY CHARLES DAY.

In the machine shop of a short time since, in fact in many of today, no one can be found who knows anything of cutting speeds of which different brands of tool steel will permit, the size of cuts that the various machines will pull, the feeds that are or should be used and so on. In a shop of this character one usually finds the tool steel and machines ordered through a purchasing department, by men who do not understand the first thing about the requirements to be fulfilled or the relative merits of different machines. It has never occurred to such

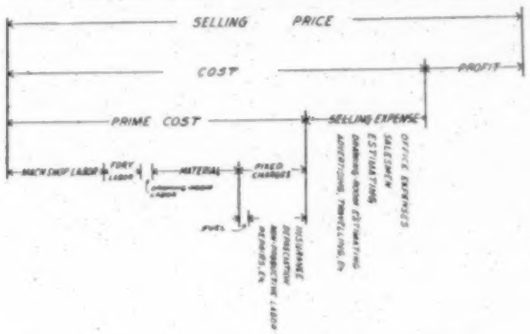


FIG. 1.—GRAPHICAL DISTRIBUTION OF SELLING PRICE.

men to study or analyze the conditions, and what seems to be economy to them, in many cases represents a most extravagant policy. Intelligent anaylsis is the only method to pursue in work of this kind, but we must ever keep before us a broad view of the subject, that the relative importance of the various factors be evident. It is easy to become so interested in a given detail—the motor drive as an example—that its true position in the general scheme is entirely lost sight of and one's judgment becomes, as a consequence, of little value.

As an example, we will consider a plant composed of foundry, machine shop and office, manufacturing complete machines from the crude material. The only way the relative data can be quickly grasped is by presenting it graphically to

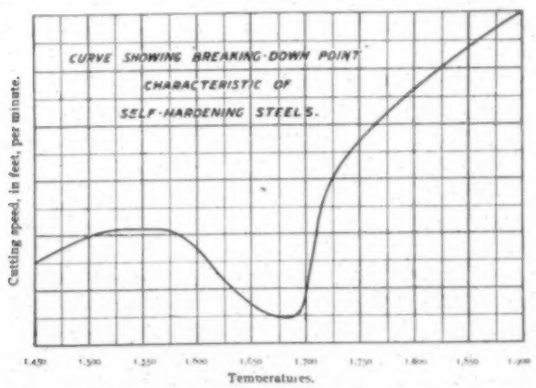


FIG. 2.—CURVE SHOWING PRINCIPLE OF TAYLOR-WHITE PROCESS OF TREATING TOOL STEEL.

the mind. The chart, Fig. 1, may be taken as the distribution of cost of the finished product of the plant in question.

When the data can be compared in this way the relative importance of each factor can be realized at a glance, the advisability of an expenditure of energy or money in any direction readily determined. In this connection I wish to refer to the indirect savings for which we must ever be alert. For example, a concern manufacturing a standard article may, by a reduction in first cost, make possible a large increase in sales, while in a works of different character no such advantage would be gained. The value of the graphical method of presenting data of all kinds is too well understood to need further comment here; it may be of interest, however, to some of you to know that we have frequently found it advantageous

*Abstract of a paper presented before the New York Electrical Society, New York City. The author is of the firm of Dodge & Day, engineers, Nicetown, Philadelphia.

Experiments on Cutting Speeds

DODGE & DAY

November, 24th, 1902. Kind of Steel in Tool SELF HARDENING.
Forging No. Cast Iron. Kind of Tool Right Hand Roughing.
Cutting Dry TOOL— 1" by 1" Clearance Angle of Tool 8 Degrees.
Rake Angle of Tool Front 9 Degrees. Side 20 Degrees.

Experiment Number	Feed	Depth of Cut	Revolutions per minute	Kind of Tool	Duration of Cut in minutes	Time of Duty of Tool in minutes	Area of Surface in Contact	Total amount lost Depth in inches	Velocity	Approved	Does Lengthened Feed of Tool in inches	REMARKS
24	.0404	3/16	97 91.9	Taylor White H.S.H. No.1	16 1/4	21 3/8	21	0	150 154	20 9	16 1/8	RUINED.
25	.0404	3/16	105 100	Capitol No.1	20	"	"	18 1/8	170 172	24 5	21 3/8	FAIR.
26	"	"	108.3 104	Capitol No.2	20	"	"	37 7/8	171 172	24 5	32 1/16	GOOD.
27	"	"	104 101	Capitol No.3	15	21"	3/8	0	167 170	27 8	14 1/8	RUINED.
28	"	"	104 101	Taylor White No.1 T.W.	11 1/4	"	"	14 1/8	164 179	25 5	12 1/8	RUINED.
29	"	"	100 99.1	Jessop No.1	20	"	"	27	152 155	26 5	20 7/8	GOOD.
30	"	"	105 103	Jessop No.2	20	20 5/8	20 1/4	0	166 167	24 5	22 11/16	RUINED.
31	"	"	107 107.9	Jessop No.1	20	"	"	22 1/16	168 170	24 5	23	GOOD.
32	"	"	110.8 111.6	Jessop No.4	13	"	"	42 1/16	168 170	25 5	16 1/8	GOOD.
33	"	"	125 115	Jessop No.3	2 1/12	20 1/4	19 7/8	0	168 170	26 5	2 3/4	RUINED.
34	"	"	110 109	Jessop No.2	10 3/4	"	"	2 1/4	167 170	26 5	17 5/16	RUINED.
35	"	"										

FIG. 3.—PORTION OF RECORD SHOWING METHOD OF TABULATING TOOL STEEL.

to lay out executive charts or the course the mail pursues in passing through the departments of a large organization in this way.

Referring again to the graphical distribution of the selling price, the part that is of interest to the shop manager is the prime cost; it should be his object at all times to lower this figure. It is impossible by guess to determine what course to pursue, thorough study of all conditions of the particular

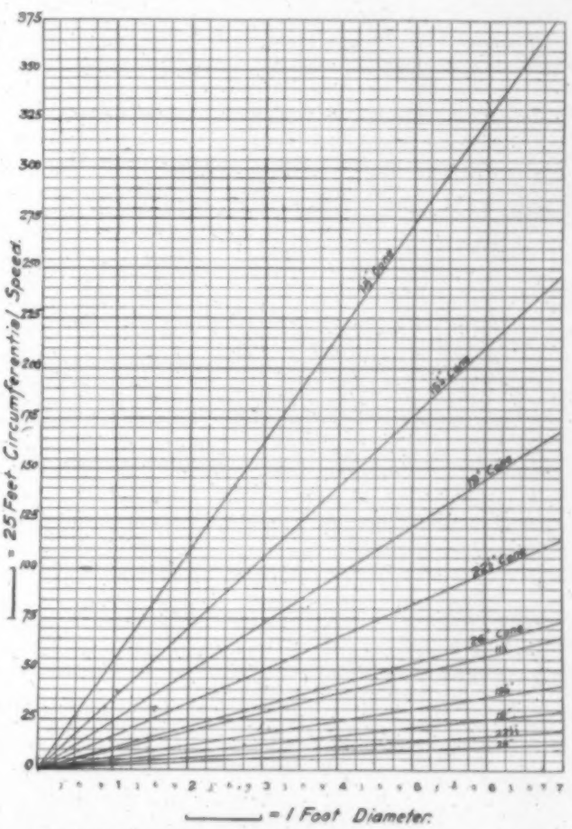


TABLE OF CIRCUMFERENTIAL SPEED FOR WORK OF ANY DIAMETER.

FIG. 4.—CHART USED FOR DETERMINING CUTTING SPEEDS.

case in hand being absolutely essential if we desire to approach an efficient result.

The fact that a shop exists is proof that the articles manufactured are needed, and it must always be the first consideration to fulfill this need to the best advantage. In other words,

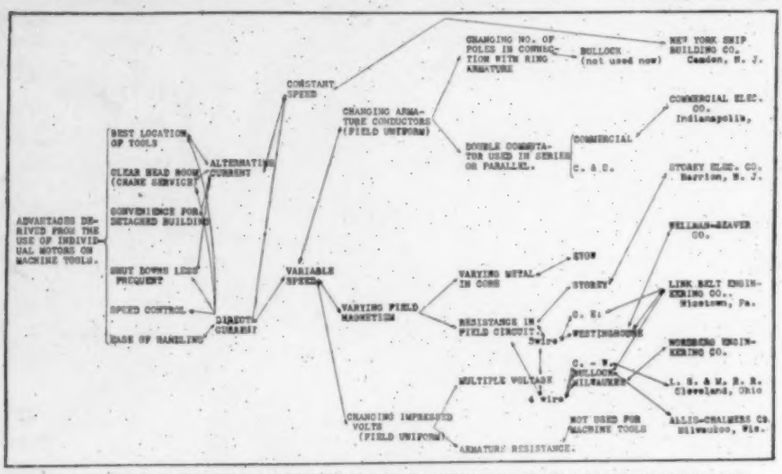


FIG. 5.—PRINCIPAL ADVANTAGES AND VARIOUS METHODS THAT MAY BE ADOPTED FOR DRIVING MACHINE TOOLS.

we must not enforce economy in the shop by sacrificing vital features in the product. I can call to mind half a dozen of the largest plants in this country, establishments noted the world over for their product, whose shops are most inefficient as far as equipment and organization are concerned, but through exceptionally clever design or selling ability the inefficiency of the shop is outweighed many times. This is no excuse for these conditions, and such concerns may, under changing conditions, be seriously affected by the inefficiency to which we refer. It is proof, however, that very few noted establishments have more than a few lines developed to the high pitch demanded by present conditions, the final result being that one will average with another, but from widely different causes.

We will now devote our attention to shop conditions, and, if necessary, it would be easy to analyze still further the fixed charges, labor and material shown above. The former can be divided into insurance, depreciation, repairs, power, etc. Labor may be subdivided into productive and nonproductive, and material into proportion of steel, cast iron, brass, etc. The more subtle factors, such as sanitary conditions and light, must also be constantly borne in mind. Of all these factors we will consider only the equipment and means which may be necessary to enable the workman to use it to its full capacity.

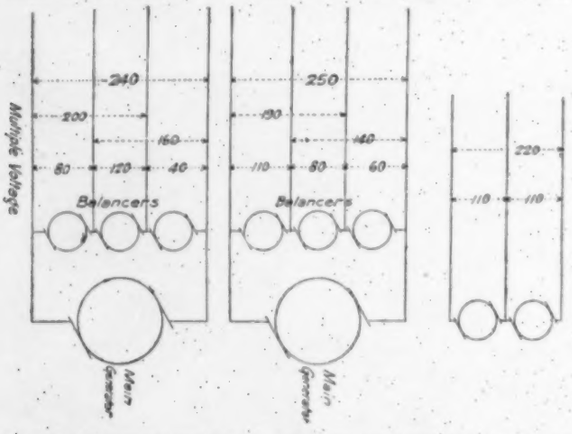


FIG. 6.—SCHEME OF VOLTAGES ADOPTED BY MANUFACTURERS OF THREE AND FOUR WIRE SYSTEMS.

We must start in the pattern shop or forge department, and see that everything is done to facilitate future handling and machining. A lug on a heavy casting to make it easy to catch hold with the crane, or in some cases additional metal to remove, to prevent the possibility of working too close to the chilled scale, will frequently effect more saving than is possible by other means. We must ever keep in mind that the object of our work should be to execute a job most efficiently the first time in the shop; efficiency being used in the broadest sense, and not necessarily implying that the cheapest production is arrived at as attained when manufacturing in quantity, as special tools such as are frequently required in such a case would not be justified. Referring again to the example under consideration, we will suppose the castings have been received in the shop and the method of machining determined upon. A certain amount of metal has to be removed and a definite finish is required, our object being to accomplish this result in the least possible time, or rather at the least expense.

The tool steel is the keynote to the situation, and a complete knowledge of its characteristics and possibilities form the starting point for all future work. Carbon steel will give a finer finish on steel than the air-hardening variety, and for form cutters is still largely used. Where heavy roughing cuts are possible, air-hardening steel has unquestionably replaced it; and, in fact, the recent developments in the processes of hardening have been the direct means of revolutionarizing old methods of machine tool design and so-called shop practice. We must ever bear in mind that "best shop practice" should mean "arriving at the desired result at the least cost," and can be used

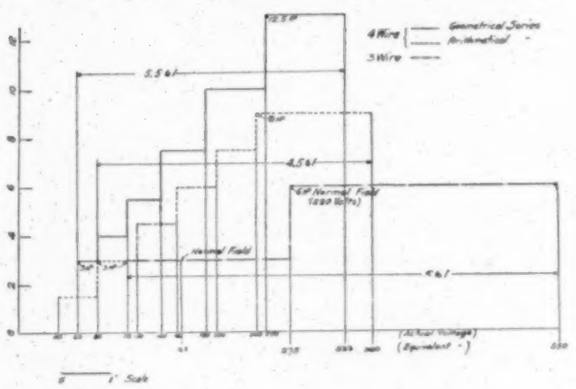


FIG. 7.—HORSE POWER CURVES OF THREE AND FOUR WIRE SYSTEMS.

in a relative sense only. We constantly hear machinists condemn a means of arriving at a result irrespective of its merits, their reason being that "it is not good practice." If drilling with a feed of 1-16 of an inch per revolution gives the desired finish in much less time, it is certainly good practice, and if under these conditions we find a sharp point on the drill is not essential, so much the better. I have cited this particular instance as it recently came under our notice, when experimenting with some twist drills, which continued to do good work when pronounced as ruined by several machinists who were watching the tests.

The influence of the Taylor-White process has been so revolutionary in character that I feel justified in dwelling upon it for a few moments. The underlying principle of this discovery is clearly shown in the accompanying curve, Fig 2, which is plotted from values of cutting speeds and temperatures. It will be seen that this curve rises from the zero point until 1,550 degrees are reached, when the cutting values suddenly fall off, this representing the full extent of our knowledge, when the experiments at Bethlehem were undertaken. The most interesting and valuable fact, that these values again increase if the hardening temperature is carried beyond the "breaking down point," was the result of work just referred to, and the superiority of steel treated in this was as compared with Sheffield Mushet—which was probably equal to any air-hardening steel on the market at that time, may be expressed as follows:

	Mushet.	Taylor-White.
10 C Steel	1.0	2.2
80 C Steel	1.0	3.5
Cast Iron	1.0	1.3

These figures are the result of a series of tests conducted by the Franklin Institute and represent the facts as nearly as they could be determined. There are now a number of makes of steel in the market treated along the lines explained above, which give equally good results.

An exact knowledge of the cutting speeds of which these tools will permit when machining different materials, and the power to pull various cuts under all conditions, are absolutely essential if we wish to properly design machine tools, or use them to their full capabilities in actual service. The value of this information is now being realized by several of the machine tool builders, and the results are already being felt in the shop in the form of much more efficient machine tools.

The motor drive makes the measurement of power so simple that we may arrive at these results with comparatively little difficulty. We recently conducted in the shops of our clients, the Link-Belt Engineering Co., a series of experiments to determine the best air-hardening tool steel for use on cast iron. The lathe used gave 126 spindle speeds, 5 percent increments, and is especially adapted to this work. Electrical instruments were employed to give a record of the energy absorbed and the cutting speeds were carefully determined by suitable instruments. Fig. 3 is a portion of a record and shows our method of tabulating the data. One hundred and twenty-five tests on various tools were made in this series of experiments, the depth of cut and feed being kept constant and the

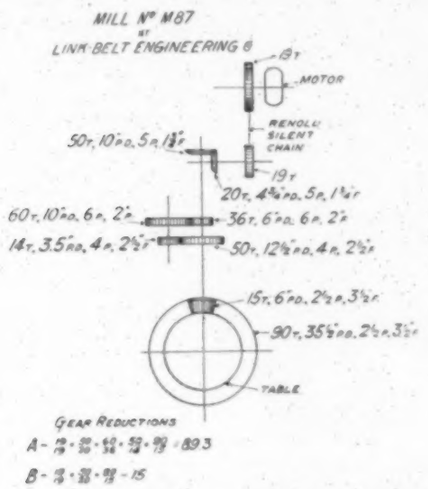


FIG. 8.—TRAIN OF DRIVING GEARS OF BULLARD BORING MILL.

speed varied so that the tool would last just twenty minutes.

A few experiments will prove of little value, as the factors are so variable in character. The uniformity of the tool must be determined, then the cutting speed for material of all kinds, and finally the relations between these quantities should be ascertained and empirical formulæ derived. This has been done for certain conditions b Mr. Carl Barth. With the present light on the subject, it seems strange indeed how machine tools could have been designed in the past, and it is not strange that we can now criticise the course pursued. We do feel, however, that the manufacturers of such apparatus are slow in adopting the proper course, although in every instance we have found them open to conviction and glad to discuss the problem from the present standpoint.

It is not now my intention to discuss the subject of machine tool design, but I do wish to say that the most inefficient part of most shops is the machine equipment, and until the user of this apparatus realizes this point and demands machines designed along the correct lines, the desired result will not be reached. To those who have not given the subject close study, this statement may seem to be without foundation, but it matters not what type of tool we consider, its shortcomings can be readily pointed out. The feeds on the average drill press are ridiculously low, the power supplied and rigidity of the frame on machines using multiple cutters are out of all proportion to the work we should be able to absorb at the cut, and so on.

Reference was made above to several tool builders who are breaking away from preconceived ideas of machine design; the roughing lathes made by Lodge & Shipley, and the Bullard Machine Tool Co., and the Bickford radial coming to my mind in this connection. The Lodge & Shipley reducing lathe was designed to pull, if I remember correctly, cuts aggregating in cross section 3 inches deep and 1-16 inches feed, the cutting speed being 50 feet per minute, and material 50 C. steel. The belt will deliver 50 horsepower at the tool post, and the construction of the bed is such that this power can be utilized without undue vibration.

In all discussions of this kind we must ever keep before us the fact that some work will permit of heavy cuts and coarse feeds and some will not, but even in the latter cases there are many ways open to cheapen production. Where the work is light and the operations of but short duration, it is very essential that the changes in speed should be obtained with the least loss of time; in other words, "ease of handling" is a most important factor.

I think we are now in a position to consider the method of driving machine tools, the requirements to be met being the following: A machine having been designed for a given duty, its maximum and minimum speeds are limited by the character of the work it will do. The number of speeds is determined by the character of the metal machined, and the uniformity of the tool steel and the power required is fixed by the most severe conditions it must meet. For the average machine tool we do not think present conditions demand a closer speed regulation than 10 percent, as no good means has yet been reached for determining the character of the metal, and in the average shop

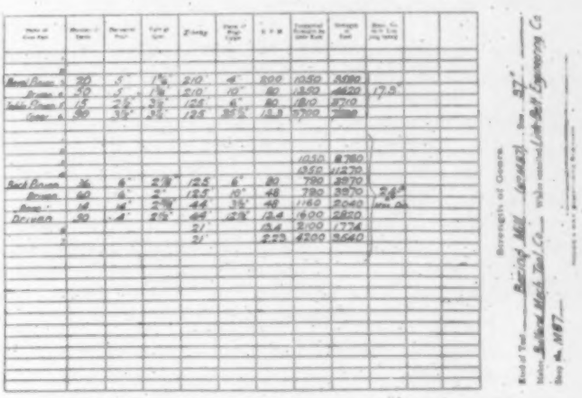


FIG. 9.—TABLE OF GEAR DATA FOR BULLARD BORING MILL.

little is understood about the relations existing between feed, speed and depth of cut for various materials. There are two sides to the question, viz: the refinement of speed required by the various elements with which we are dealing and the possibility of using this refinement to its full efficiency in actual practice. The first set of requirements may demand a speed regulation of 10 percent, while the second would indicate that it is extremely difficult to use it to advantage in actual practice with present facilities.

We have recently visited nearly every shop in this country where an extensive motor equipment has been installed and without exception have found these conditions to exist. For certain classes of work, slide rules based upon the empirical formulæ referred to above seem to us to be the only solution to the problem. By means of these most ingenious rules, it becomes possible to instruct the workmen how to do the work to insure maximum efficiency, the feeds, speeds and cuts all being dictated indirectly by the positions of the various handles and gears controlling these factors. The slide rules must be in the hands of a force of men who are perfectly conversant with machine shop work and able to lay out the course any particular piece should pursue in going through the shop. The value of these rules—if surrounded by the proper organization—has been fully exemplified by Mr. Taylor at the Bethlehem Steel Works, and I imagine most of you are acquainted with the story of the development of this plant while under his direction.

The cutting speed for steel is determined by the tensile

strength and elongation, while for cast iron the problem is still more complex. The hardness is affected not only by the chemical composition, but also by the method of cooling and size of casting, so that we seldom find two castings that will permit of machining at the same speed. It is possible, however, by careful observation and experiment, to ascertain approximately for a given shop the cutting speeds of which various jobs will permit, so it is absolutely essential to have some good means of determining it. It is impossible to judge the speed by eye, even where a man works on the same tool continuously; nor will the character of the chip when cutting cast iron indicate the proper speed.

As a means of remedying this difficulty, we have used charts (see Fig. 4), which enable the men to ascertain the cutting speed from a knowledge of the diameter of the work and location of belt and gears. We have found great difficulty in making the men sufficiently familiar with these charts to use them to advantage, and now feel that the explanation necessary largely offsets their value. The antagonism when introducing new methods or machines, so often evidenced by the men, is largely eliminated when the innovation is so extremely simple that its use can be grasped by the men at once.

A much better scheme than the charts is the use of tables designating the spindle speed for each point of the controller or position of the belt, as feeds are frequently enumerated on lathes, etc. When slide rules are not used, a "speed tally" on

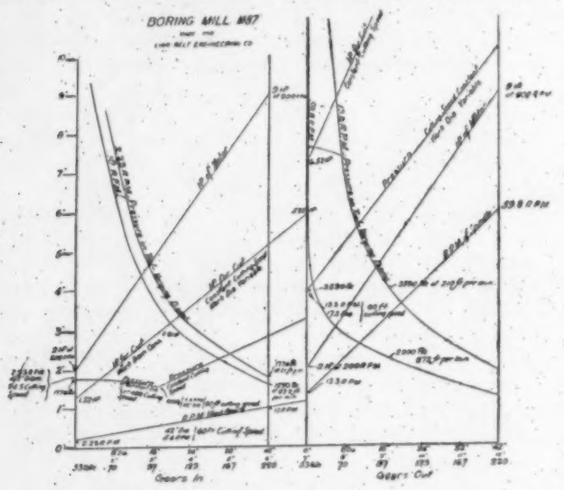


FIG 10.—CURVES COVERING PRINCIPAL DATA RELATIVE TO DRIVING MECHANISM OF BULLARD BORING MILL.

each machine would be the only proper way of enabling the workman to know the speed at all times. No skill is required in its use or time lost in making the reading. A tachometer suitable for this work has not yet been placed upon the market, but on a recent visit to Milwaukee, I had the pleasure of seeing one that has been developed and patented by Mr. A. P. Warner, of the Northern Electrical Manufacturing Co., of Madison, Wis., and which I think will meet all requirements.

We have not touched on the labor problem, and in this connection I will say that we must ever bear in mind that the effort is proportional to the incentive, and in most shops running with an old equipment the latter has been utterly inadequate to call forth continued energetic service from the men. In our estimation the most characteristic and valuable features of the electrical systems, which we will now consider, are the elimination of complication and physical effort in handling the machines, and the direct advantages resulting from this cause may be very far-reaching.

The inefficiency of the belt and step cones, as a means of machine tool driving, even when installed in such a way as to permit of good crane service, is too well understood to demand much consideration here. It is not a question of does it fulfill present conditions, but will it meet the new requirements resulting from the advance in tool steel, and our better knowledge on the subject? It certainly will not. The motor is an equally poor investment if, after its introduction, the shop is run along the same old lines, and for this reason an understanding of its possibilities is most essential. I refer, of course, to the motor on individual tools, and, although my remarks are general in character, it is understood that we do not for a moment advise its use on every machine, our views on this subject being rather conservative. The accompanying chart, Fig. 5, was made by us some months ago to show at a glance the different methods on the market for motor-driving machines, and may prove of interest here. The constant speed motor, particularly of the alternating type, is so simple in character we naturally turn to it as a possible solution to the problem. It lacks, however, the two great essentials, ease of handling and speed regulation, and all attempts to supply these shortcomings by mechanical means have so far proved unsatisfactory.

The induction motor is a source of power, just as the line shaft, and the principal advantages resulting from its use are clear overhead room, independent location and possibly a saving in power.

The variable speed countershaft would seem to be a natural solution, and in this connection I think I can safely say we have tested all the principal designs on the market. Speaking generally we have arrived at the conclusion that all such devices that depend upon power transmission through frictions, are unsatisfactory for general adoption in the shop, and in most cases the method of handling is not comparable with the multivoltage systems that I will describe later. We feel that a variable speed countershaft that is to meet with the success anticipated by some engineers must be handled from a master control, and in fact do everything that is possible with the highly perfected electrical systems that are now being installed.

Having made up our minds that the ease of handling and close speed regulation cannot be efficiently obtained with the constant speed motor, we will direct our attention to the variable speed type. Fig. 6 shows the schemes of voltages adopted by the principal manufacturers of multiple-voltage apparatus, one sketch showing a three-wire system and the other two four-wire systems, the voltages being arranged in geometrical and arithmetical progression respectively. In the first instance but two voltages are used, while in the latter case six are possible.

Intermediate speeds are obtained by inserting resistance in the field, 100 percent variation being necessary in the three-wire systems, as compared with 30 percent in the four-wire. In either case the horse power that the motor can develop satisfactorily is directly proportional to the voltage.

A comparison of the underlying principles of these systems is clearly shown by the accompanying curves, Fig. 7. It is interesting to note the relative sizes of motors required to obtain a given range, but in this connection we must not form a hasty conclusion, as the cost for a given horse power depends upon the system adopted. That is, with the three-wire scheme there may be a variation in speed of 150 percent by field weakening alone, a special field winding being necessary.

The satisfactory operation of these systems can only be ascertained after experience with the apparatus in the shop, so we can readily see how many considerations must be looked into before a final decision as to their relative merits can be reached.

In a desirable system, standard motors should be utilized, the controller operated by a single handle, and the entire range of speeds passed over while the work continues. The range of motor speeds is a most important factor, as the first cost of the motor, the cost of the installation and the efficiency of the outfit are all dependent upon it. It is impossible to lay down any fixed rules to base our discussion on, as each machine is a different problem, and must be treated as such. For general machine shop work we have found that a range of 4 to 1 to 6 to 1 adapts itself to all conditions fairly well, but in every case where old tools are being equipped we must be satisfied with a compromise.

Thinking that the course we adopt when applying a motor might prove of interest, I present part of the data to simplify the explanation. The example I have chosen is a 37-inch Bullard boring mill, Fig. 8, showing the train of gears from the motor to the table. The first reduction is fixed by the slowest table speed required, which in turn depends upon the tool steel, the maximum swing and metal machined.

The horse power is first figured from the maximum cut to be

removed, but as the machine is frequently too weak to stand this work it is always essential to investigate the gears and other details. The gear strengths are based upon Wilfred Lewis' formula, and the weakest gear is readily determined when the data is gotten into such shape, as is shown in Fig. 9. For a given cutting speed the least cross section of cut that can be removed is at the slowest spindle speed of each reduction; the column shown to the right represents the pressure on the tool that can be exerted at this point.

The curves (Fig. 10) cover the principal data relative to the driving mechanism, and show at once the cuts that can safely be removed on any diameter at any speed. The motor horse power is also plotted, and the overload that the gears are subjected to is clearly shown.

The most important question of all is, when is the saving sufficiently large to justify the expenditure? I have frequently said that we have endeavored to show by exact figures when it pays to use individual motors, but such reasoning has always proven most unsatisfactory. We must study present conditions, and in each case see how much they will be bettered by the use of a motor. Crane service alone may be ample reason for its adoption, or, again, where the intelligence of the men or facilities offered, make it possible to run each tool to its limit. We must ever remember that the belt drive, as applied to most machines, does not permit of running to the tool limit on the average job, while the motor, if properly installed, offers the opportunity. It can do nothing more. If we cannot accurately figure beforehand what economy will result from the use of the motor, it may at least be of interest to investigate the records of shops who have made such installations. We must, however, be very careful not to draw too hasty conclusions as to the merits of the apparatus from such investigations, as the equipment is utterly useless without the management and organization behind it.

In the shops of the Link-Belt Engineering Co. an accurate record extending over five years gives the pound cost of machining, and the reduction in this figure during this period gives a more accurate gauge of the economy affected than any other method. These figures were compiled by a disinterested party, and after taking into account every detail which might in any way introduce an error, and allowing the men a decrease of 10 percent in time, with the same wages per week, a clear saving of 30 percent on the entire labor bill was shown. The problem is such an involved one that it would be decidedly wrong to attribute this sum to any direct cause, it being the result of better management, equipment and understanding of its possibilities. It is needless to say that this saving is vastly in excess of the interest and depreciation of the entire expenditures necessary to bring about the result.

I again want to repeat that the successful engineer must ever keep foremost in his memory the utility of the apparatus he is designing, the importance of the management and organization, and the great value of anything which simplifies these underlying factors of all manufacturing establishments. In conclusion I feel that I cannot do better than quote the conviction of one of the greatest managers, who said in substance: If you swept from him trade, factories, and finances, but left him his organization of captains, that minimum cost could be secured throughout every detail of mining, shipping, refining and manufacturing, that instead of doing part excellently and some badly, in a few years his cost advantage would restore his trade, plant and facilities. So certain was he others would do both well and ill, not well throughout.

A New Mixture for Boiler Scale.

A patent has recently been granted to John N. Henderson, of New Orleans, for a compound for removing scale from steam boilers. The compound is said to be composed of the following ingredients: Parched ground coffee, extract of logwood, blood-meal and salt; all thoroughly mixed with water and "substantially as described and for the purpose set forth."

The Witte Iron Works Co., Kansas City, Mo., manufacturer of gas and gasoline engines, is increasing the capacity of its plant 50 percent by the installation of additional machinery.

A METHOD OF INDEXING CUTS.

The people with whom the writer is employed are wholesale stationers, do a varied manufacturing business along the same lines, and use thousands of wood cuts and electros in their general advertising and cataloging, as well as the usual large number of customers' cuts. The keeping track of these electros has always been a source of considerable trouble, the foreman being the only person having knowledge of the whereabouts of cuts not recently used and in his absence a long search is sometimes necessary. These electros are stored in a building a short distance from the composing-room, and compositors not overly ambitious, having occasion to use said cut or cuts, may perhaps spend two hours ostensibly looking for the same.

A system found to answer all requirements and easily put into practice in any office is as follows: The cuts should be stored in drawers or on shelves so as to occupy as little space as possible. Each drawer or shelf is filled completely with cuts as far as they go. Each is then emptied by itself and the cuts from that drawer or shelf are numbered on end or side with steel numbering punches, commencing with No. 1 for first cut of the first drawer and so on up. Proofs on paper of convenient size to hold several cuts are then taken and the first and last numbers marked thereon. The cuts are replaced in the drawer, and the beginning numbers are plainly marked on the outside of the drawer. Drawer No. 2 should commence where No. 1 left off, and so on through the whole series. The proofs can be fastened together in book form in consecutive order and put in a convenient place for reference.

Any electro desired may be found at once in the book, and the drawer-number will tell the location instantly. Should the numbers on the cuts run into several figures, a new series may be started and a letter or other character prefixed to the numbers of the second series, thus: A1, B1, etc.

No doubt there are many systems in use for the intelligent indexing of cuts, but the scheme here outlined seems to be simple and to fulfill all requirements, and in so far as the writer is concerned is original. The veriest "round-head" could hardly be excused for mislaying an electro or engraving when its proper place is so seif-evident.—M. F. M. in Practical Printer.

A Rolling Process for Making Screws.

A press dispatch from Springfield, Mass., says that "George Warwick, inventor of the Warwick bicycle, has just perfected a machine for the automatic manufacturing of screws, which, under severe tests, has proved capable of turning out 1,500 finished screws an hour. The machine, it is believed, will revolutionize the manufacture of these articles, as machines now in use turn out less than 1,200 an hour, and the product has to be slotted on a second machine. The Warwick machine threads and heads its screws, turning them out complete. The new machine will also practically do away with the enormous waste upon the old style machines estimated at about 33 per cent of the raw material."

A year ago this inventor obtained a patent on a method of manufacturing spokes for bicycle wheels. The spokes were subjected to a rolling process which reduced the middle portion as well as threaded the enlarged ends. Since that time he has been at work upon a machine which would have a greater usefulness in the manufacture of screws and in all likelihood has adopted the same system in his later product. At any rate he submits the following statement in reply to an inquiry and regrets he cannot at present be more explicit in regard to details. "The new machine takes the stock from a coil, cuts it into the required lengths, rolls and elongates the body portion, threads and slots at the rate of 1,500 3-16 inch screws, one inch under the head, per hour. These different operations are accomplished on one machine with virtually no waste and no oil is used beyond the small amount for lubricating. This means the elimination from factory cost of the two items, lard oil and waste."

The first car wheels ever cast at Atlanta, Ga., have just been completed by the Atlanta Car Wheel Co. Eighty-seven wheels were cast, each 33 inches in diameter and weighing 600 pounds. The plant will have a capacity of 300 wheels per day.

A NEW QUICK FEED GEAR BOX.

The four illustrations show front and end views of the recently patented quick feed gear box brought out by Schumacher & Boye of Cincinnati. The device is seen as applied to lathes of from 18 to 32-inch swing for feeds and screw-cutting purposes.

Fig. 1 is a front view of lathe with quick feed gear box; Fig. 2 an end view of quick feed gear box for lathes; Fig. 3 an end view showing the construction of quick feed gear box; Fig. 4 a front elevation showing details of construction.

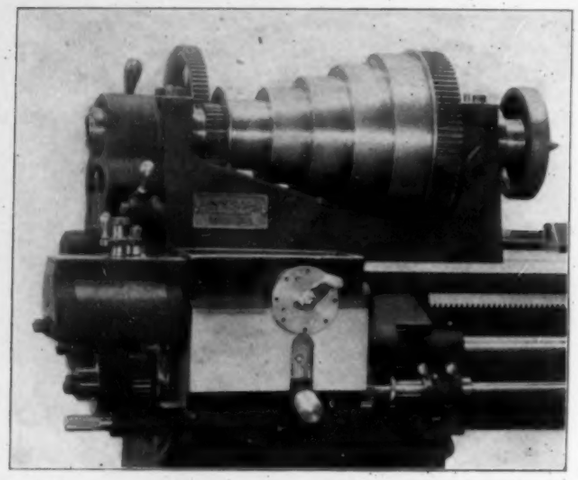


FIG. 1.—FRONT VIEW OF QUICK FEED GEAR BOX.

Power is delivered from the live spindle A to the lead screw through the spindle B and the slip gear C engaging the gear X; and to the feed rod through the spindle B and the slip gear C engaging the loose compound Y and gear Z mounted on the feed rod. The varations in speed being between these two spindles, A and B, the slip gear D mounted on the shaft A is moved lengthwise by the yoke E mounted on the rack plate F. This is adjusted by the lever G according to the front index plate H and engages any one of the eight cone gears mounted on the shaft B. The shaft B with its cone of gears being mounted on the swinging bracket K which is provided with an arm L and a pull pin M. The pull pin engages in the rack plate F by dropping into any one of the eight holes in the same corresponding to the gear engaged. The bracket K is mounted on the swinging shaft N which is in line with the lead screw—a continuation in fact of it.

The compound slip gears O O being mounted on the shaft A are moved lengthwise by means of the yoke P attached to the rack Q which is adjusted by the lever R according to the top index S. These gears engage with the intermediate T and the compound intermediate gears U and V mounted on the swinging bracket W.

The operation of the device is effected by disengaging the pull pin M and dropping the swinging bracket K which allows the removal of the slip gear D to any desired position by the lever G (according to the front index H) and then reengaging the pull pin M to lock the arrangement in place. In this manner only the operator may obtain eight changes of speed.

The bracket W may also be dropped and the slip gears O moved so as to engage respectively with the gears T, U and V by means of the lever R according to the top index S. In this way five additional changes may be obtained which of course multiply the eight changes obtained from the cone of eight gears on the shaft B. The combination results in a choice of forty changes in all.

In the case of feed changes the arrangement of the gearing allows a multiplication of the lead screw and thread-cutting facilities by four times the turns per inch. In order to obtain the different feeds the slip gear C is engaged in mesh with the loose gear Y and then the workman proceeds as already described for lead screw changes.

The half tones show other points of intertest in connection with the latest type of lathe—more particularly those common to sizes from 36 to 42-inch machines of this make. The reverse movement, for carrying the feed in either direction, is in the apron, and when the feed is engaged, mechanism has been provided so that the half nuts can not be engaged until the feed is in turn disengaged; neither can the feed be engaged by any possibility while the machine is cutting screws. The cross feed is operated by pulling a button forward or pushing it backward to engage or disengage as the case may be. The cross and length feed can at pleasure be operated simultaneously. The carriage is firmly locked while the cross feed is at work, by moving an eccentric clamp downward. The clamp used for this purpose is located conveniently at the right of the cross feed crank.

These triple geared engine lathes have been made to meet modern improved tool steel requirements and to handle the heaviest kind of work rapidly and with economy. In addition to the patented instantaneous change device for feeds and screw cutting, they are equipped with box apron, preventing overhang and straining of pinions and studs; power angular feed of 12-inch travel to compound rest; hammered crucible steel spindle; phosphor bronze boxes; steel gear where necessary; studs made of tool steel, running in bronze lined bearings; very long carriage gibbed on both sides.

It is stated on the authority of persons who are engaged in promoting the consolidation of the leading axe and tool interests throughout the country that all the options that have expired have been renewed up to March 1. The delay in perfecting the deal is attributed to monetary conditions, and to the fact that large amounts of various securities remain to be marketed.

The Tidewater Steel Co., Chester, Pa., has made an arrangement for coke supply with the Suburban Gas Co., of

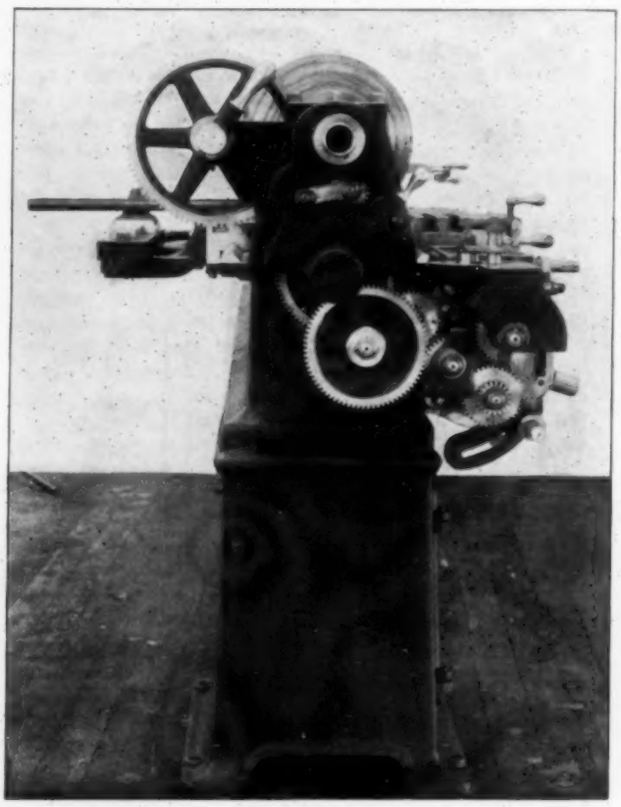


FIG. 2.—END VIEW OF QUICK FEED GEAR BOX.

Chester, and the Semet-Solvay Co., of Syracuse, N. Y. The Sement-Solvay Co. is building 40 ovens and the gas company will use the gas. The ovens will furnish the Tidewater Steel Co. its full supply of coke at about $1 less than the price it pays in normal times and $2 to $3 a ton less than prevailing prices.

THE PROVINCE OF THE DISC GRINDER.

The disc grinder is so simple in construction that it may easily fail to get the consideration it deserves; and the comparatively recent introduction of the machine into modern machine shop practice makes timely a few comments on the purpose of this class of machinery. One of the firms manufacturing disc grinders has opportunely collected some facts of this kind and has also submitted some instances of the speed at which such machines accomplish various kinds of work. The following extract is taken from a little publication brought out by the Bayldon Machine & Tool Co., of Jersey City, N. J. The pamphlet is not intended for exploiting this special make of machine, simply submitting a number of facts in grinding economy vouched for by the firm:

A disc grinder is to flat surfaces what the universal grinder is to cylindrical shapes, and much more, as it starts with unmachined stock, namely, the rough casting or forging. Today it does not pay the manufacturer, model maker, jobber or tool maker to plane or mill small pieces of any material, or to finish at the vise with file and emery cloth, because a disc grinder properly used will do more work in less time than the machine tools, and the man with the file and emery cloth is not in the race at all. Steel discs covered with emery paper are the most rapid cutting of all grinding devices so far invented, for the following reasons:

Their cutting speed (in feet per minute) is twice that at which any emery wheel can be safely revolved.

Their surface always remains true, even when worn out, so that while cutting off stock the user is at all times producing a perfect surface which is at the correct angle with the other surfaces of the piece, without thought or care as to the angles.

These steel discs covered with various abrasives appropriate for the work are used with success on steel, cast iron, drop forgings, malleable iron, aluminum, the various alloys, gutta percha, and wood.

In machining a piece, you first have to chuck it with great care, that the surface to be produced may be at the correct angle with the other surfaces of the piece. With the disc grinder this time is saved. After machining, follows hand finishing. After disc grinder work nothing more is needed, unless it be the momentary use of a finer disc.

When emery discs are worn, they may be brought back nearly to their original keenness by lightly touching with a diamond or emery wheel dresser. This may be repeated several times on the coarser grades.

What a Disc Grinder Will Do.

It will take a piece from the rough casting or forging, and finish sides and edges, leaving them straight and accurate. For example, the brass beams for scales. The angular sides of commutator bars, it will bring to thickness and give the correct angle in one-tenth the time in which it is possible to mill them. It will fit steel keys; bevel and fit gibs; shape and finish outside of engine straps; square and size chuck jaws, wrenches, clamps, jigs.

The die maker can prepare the steel for laying out his work, saving hours of shaper or milling machine work. Many forms of punches may be fitted without machining. Worn punches and dies can be sharpened. Arcs of circles can be accurately and quickly finished by swinging piece from a center pin located on table.

The sides of nuts (whether brass, cast iron, machine steel, or hard tool steel) square, hexagon or octagon, can be slabbed to size and finished in one-quarter the time, or less, that it would take to do the same with a pair of cutters upon a milling machine.

To shape and square pieces of machine steel from the bar, dimensions 3 by 2 by ½ inch, leaving opposite sides parallel and angles all square, required 8 minutes. A machine steel key, 4 inches long, ⅝ square, can be reduced to 3¾ inches long, ⅝ by ½ inch, in three minutes.

A disc grinder reduced by 1 inch the length of a bar of cold drawn machine steel, 1 inch square, in 10 minutes; reduced by 1 inch the length of a bar of round tool steel, 1 inch in diameter, in 12 minutes; made parallel the opposite large sides of a piece of machine steel 6 by 2½ by 1 inch, which was out of parallel, in 2½ minutes; slabbed the sides of 1⅝ inch standard hexagon machine steel nut, leaving angles correct and the opposite sides parallel, in 1 minute; finished the rough end of a cast iron bar whose cross section was 2½ by 1¼ inches (about 3-64 of stock removed), in 30 seconds; roughed and finished edge of circle of 24 inches diameter steel plate ⅝ inch thick, in 15 minutes. To turn this piece in lathe formerly took 48 minutes, as it was not round, but polygonal, being cut out from boiler plate with power shears.

The rough end of a steel bar, just as it came from the saw, having a section of 1½ by 6 inches, was finished in 1½ minutes. The same cross section in cast iron (its surface not previously machined), was finished in 2¼ minutes.

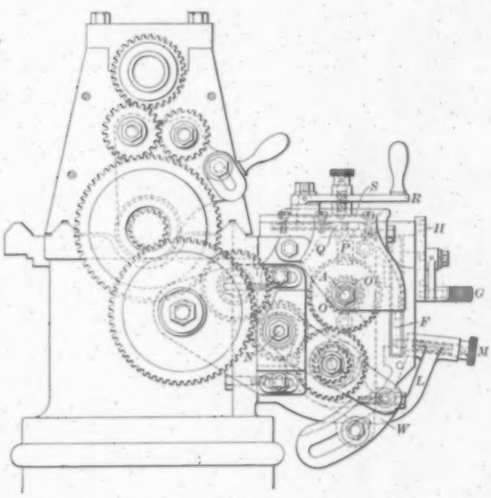


FIG. 3.—END VIEW IN SECTION SHOWING CONSTRUCTION OF GEAR BOX.

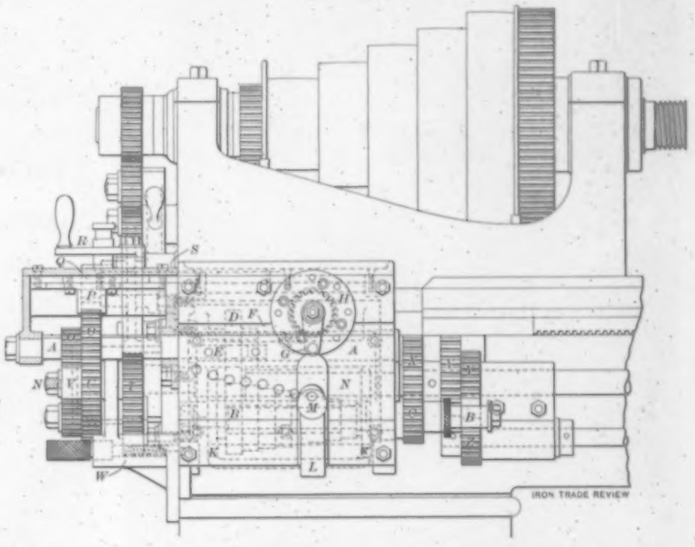


FIG. 4.—SECTIONAL VIEW OF QUICK FEED GEAR BOX.

The *World's Work* for February has an appreciative article by Arthur Goodrich on the "United States Steel Corporation's Profit-Sharing Plan." An unusual article, accompanied by striking pictures covering 20 pages, is that of Lieut. Commander Albert Gleaves on the "New Navy at Work." Louis James in a valuable article on German business methods considers in one part of it Germany's industrial efficiency and strengthens one's impression of the extent to which technical training is telling upon the development of manufacture there.

The Philadelphia & Reading Railroad is having 500 steel underframe box cars built at the Berwick works of the American Car & Foundry Co., and 500 steel hopper coal cars at the Standard Steel Car Co.'s works, at Butler, Pa.

Surveying Instruments in the Westinghouse Electric & Mfg. Co.'s Shops at Pittsburg, Pa.

The magnitude of the work done at the plant of the Westinghouse Electric & Mfg. Co., at East Pittsburg is well illustrated by the paper read at the recent meeting of the American Society of Mechanical Engineers by C. C. Tyler, the superintendent of the works. Mr. Tyler called attention in his paper to the extraordinary dimensions of the work undertaken by the firm and the unusual demand for highly improved means of filling the requirements in electrical machinery at its present day maximum. The paper is appended and by way of introduction something may be said of the immense shops at Pittsburg. Of course the Westinghouse Electrical & Mfg. Co. is but one of the numerous Westinghouse interests, but for the purpose of the present article reference will be restricted to this branch. The three companies at Pittsburg, the Westinghouse Air Brake Co., the Westinghouse Machine Co., and the Westinghouse Electric & Manufacturing Co., have a capitalization of $50,000,000; they employ 10,000 persons, and the floor space of their factories covers some fifty acres. There are other Westinghouse interests in and near Pittsburg, such as the Nernst Lamp Co. and the Union Switch & Signal Co., (the latter at Wilmerding), in addition to the plants at Manchester, Eng., and in France, Germany, Russia, etc.

The electrical interests of the Westinghouse Electric & Mfg. Co., were centralized in 1895, which year marked the beginning of the movement toward the combination of the scattered interests of the firm, and a favorable site of 40 acres was secured at East Pittsburg with a frontage upon the Pennsylvania Railroad Co.'s tracks of 2,300 feet. Here the principal structure is the machine shop of brick fireproof construction, with steel columns and girders. The machine shop has an unbroken length of 1,204 feet with a width of 235 feet. This gives a floor space of 457,360 square feet, equal to 10½ acres. The warehouse and detail departments occupy a building at the right of the machine shop and a seven-story office structure is at the left. This building is also of brick and stone construction with a frontage of 250 feet and extends to the rear some 50 feet. The foundry, carpenter shop, punch shop and blacksmith shop are at the opposite end of the main building from the offices. The power station has a capacity in excess of 3,000 horsepower which is distributed to some 1,500 machine tools and a complete system of arc and incandescent lighting.

The several illustrations are from photographs taken in the main building and on the floor of the erecting shop. The machines in some cases are of portable type. The word portable is used with special reference to the facilities with which the machines can be handled here from place to place with the aid of unusual crane and floor conveniences, as well as the electrical equipment which one would naturally expect in a shop of this kind to see of an ample and modern arrangement. Elsewhere such machines would be anything but portable; but here the shop foundation has been laid with the solidity of a machine frame and as carefully finished and the tools are moved about with the same readiness with which the motor and generator castings are laid down for treatment. In many instances in fact, and as the illustrations show very clearly, these castings are often much more ponderous than the tools themselves.

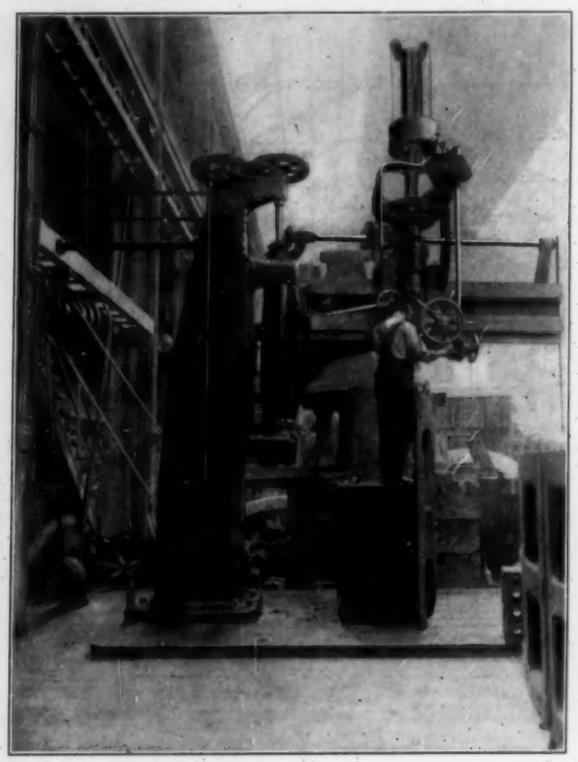


FIG. 1.—A 10-FOOT RADIAL DRILL.

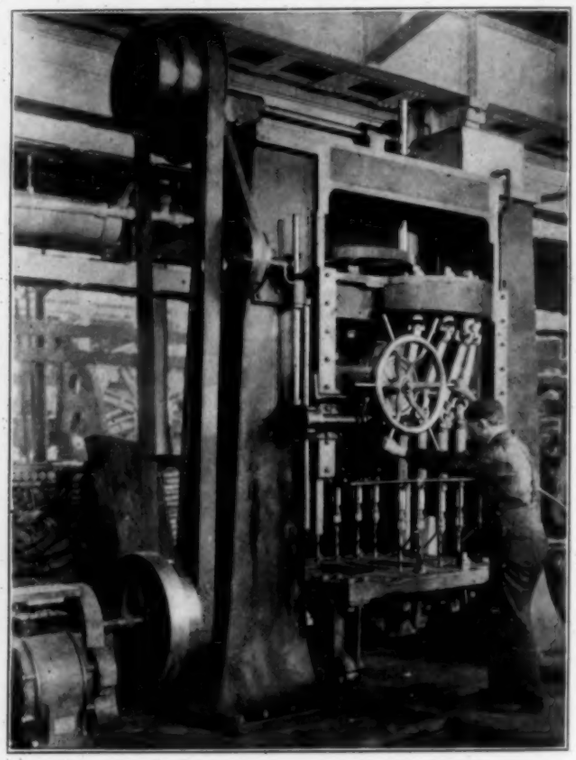


FIG. 2.—MULTIPLE SPINDLE DRILL.

The 10-foot radial drill in Fig. 1 bears the name plate of the Baush & Harris Machine Tool Co., (now the Baush Machine Tool Co.), of Springfield, Mass. Fig. 2 is a multiple spindle drill arranged for drilling the frames of railway motors. This machine was built by the Pratt & Whitney Co., of Hartford, Conn. The tool is arranged to drill ten 1 5-16-inch holes simultaneously in the steel frame, the latter being supported on the under side of the jig which travels on a runway so that the work can be readily removed and another frame substituted. The drill spindles are adjustable to any required position and have independent vertical adjustment. The machines illustrated in Figs. 3 and 4 were made at Hamilton, O., by the Niles Tool Works and in the back-

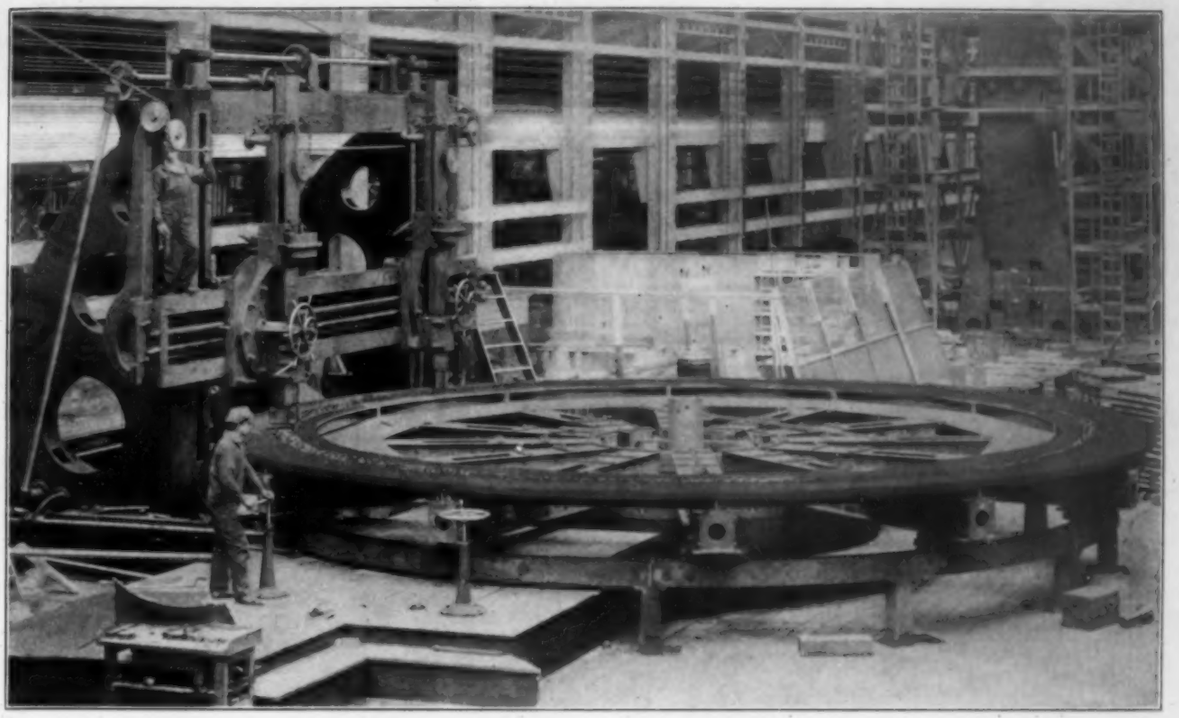


FIG. 3—16 X 36-FOOT BORING AND TURNING MILL.

ground of the former illustration will be seen the frame of a large alternator surrounded by scaffolding. This alternator was one of six intended for the New York Rapid Transit Railway and was of the same size and type as the eight machines furnished to the Manhattan Railway, these units being of 5,000-k. w. capacity. Fig. 3 shows a heavy 16x36-foot boring and turning mill of Niles Tool Works construction with external table feed, and Fig. 4 illustrates similar machines equipped with Reeves variable speed countershaft. At the extreme rear and right of Fig. 4 is a 14-foot boring and turning mill with a slotting attachment. The machine shown in Figs. 8, 9, and 10 were built by the Newton Machine Tool Works, of Philadelphia.

A SURVEYING INSTRUMENT IN MACHINE SHOP PRACTICE.

The paper prepared by Charles C. Tyler, is intitled the "Use of a Surveying Instrument in Machine Shop Practice," and is as follows:

Many machine shops now have floor surface plates upon which large work is laid out and various machining operations are performed by the use of portable machine tools secured to the plate. The quality of the work produced is largely determined by the accuracy of the laying out, the correctness of the portable tools, and the trueness of the surface plate. For work having moderate dimensions, scales, squares, beam-compasses, and straight-edges can be purchased in the market sufficiently accurate, if used by careful workmen, to meet the average requirements in laying out the work and setting the portable tools; but for work having large dimensions the scales, squares, beam-compasses, and straight-edges become quite special, are expensive, and require the utmost care in their manipulation to insure correct work. Ten-foot steel squares and beam compasses spanning twenty-five feet are not easy tools to make or handle, and the fear that errors might be made in some large work, to be undertaken at East Pittsburg, led the writer to the consideration of doing away with these abnormal tools and substituting others more easy to manipulate and of a kind to insure accurate results.

The method decided upon has proved so reliable and satis-

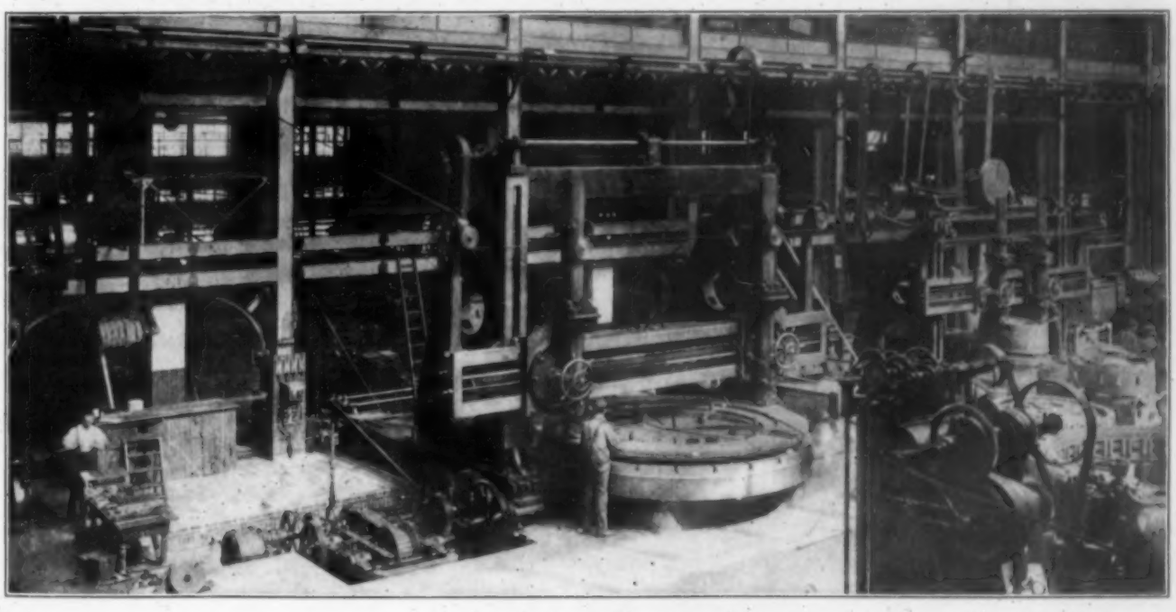


FIG. 4.—HEAVY BORING AND TURNING DEPARTMENT.

factory for nearly two years that a description of it may contain some suggestions of benefit to those using surface flor plates and portable tools. To carry out the method referred to we shall require a dividing and leveling instrument of somewhat special construction; for mounting the dividing instrument, a center column (with a taper hole whose axis is exactly perpendicular to the base of the column), a center guage, a straight-edge, several specially ruled targets, a surface gauge, and other small tools.

Let us assume that we have a surface floor plate, suitable portable vertical slotters or planers, and portable horizontal drilling and milling machines, and that we are to construct a cast-iron ring of over twenty feet outside diameter, properly proportioned. This ring is to be made of six similar sections suitably cored and ribbed, and the only operations to be described are the accurate planing of the joints, cutting the keyways, and drilling the holes for the clamping bolts.

Mount one section upon planned cast-iron blocks about two feet thick and fasten securely to the floor plate, being careful to equalize any warped surfaces found in the casting. The

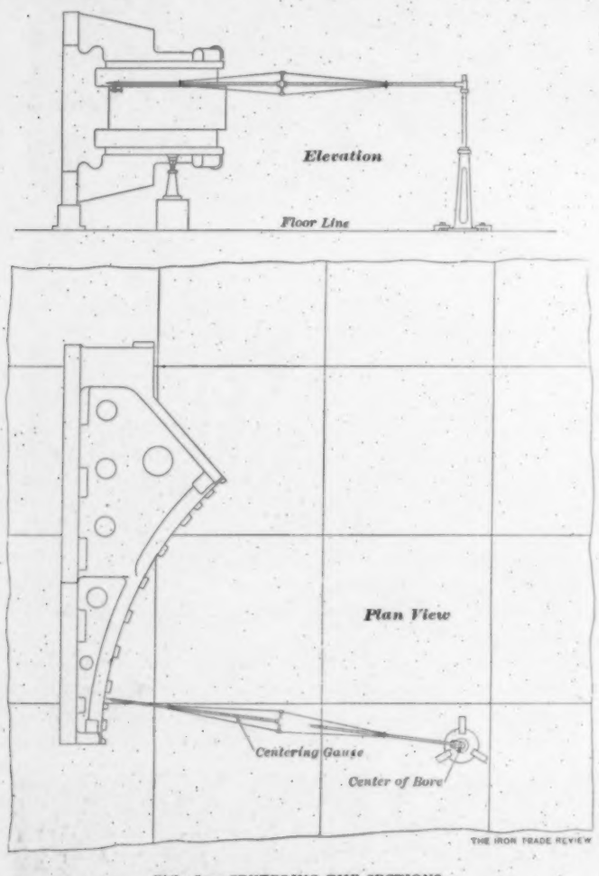


FIG. 5.—CENTERING THE SECTIONS.

center column is to be moved about upon the floor plate until its exact position in relation to the section has been determined by the use of the centering gauge, and the column is then to be securely fastened to the floor plate, where it should remain until all the operations upon the section have been completed. (See Fig. 5).

Mount the dividing instrument upon the center column, and with the telescope determine the correct position for the zero division of the divided circle, to insure equalizing the cut at each joint surface, and clamp the circle in this position. The next move is to secure a straight-edge or parallel to the floor plate in such a position that its front edge is in exact alignment with what is to be one finished joint surface. The location of the straight-edge is determined by the dividing instrument and by the use of a special target which rests upon the top of the straight-edge and has a zero line exactly in alignment with a shoulder which touches the front of the straight-edge. (See Fig. 6.) Another straight-edge is then to be secured to the floor plate under the other joint of the section, and its front edge must be set at exactly sixty degrees from the first straight-edge; its position being determined by the dividing instrument and the special target used in the previous case. The accuracy of the location of both straight-edges being demonstrated by proof surveys, we are ready for planing the joint surfaces.

Planing the Joint Surfaces.

For the joint planing operation let us use a portable vertical slotter or planer having the front edge of its base exactly parallel with the horizontal travel of the tool slide. Secure the portable slotter upon the floor plate with the front edge of its base exactly parallel to the front edge of the straight-edge; the accuracy of the setting being easily determined by a pin gauge, and the fine adjustment being obtained by screw jacks bearing against the base and stop lugs inserted in the floor plate. While the roughing cuts are being made upon one joint surface, set a second portable slotter by the other straight-edge in the same manner and proceed with the roughing cuts at this end. In order that the workman while roughing may not cut beyond what should be the finished

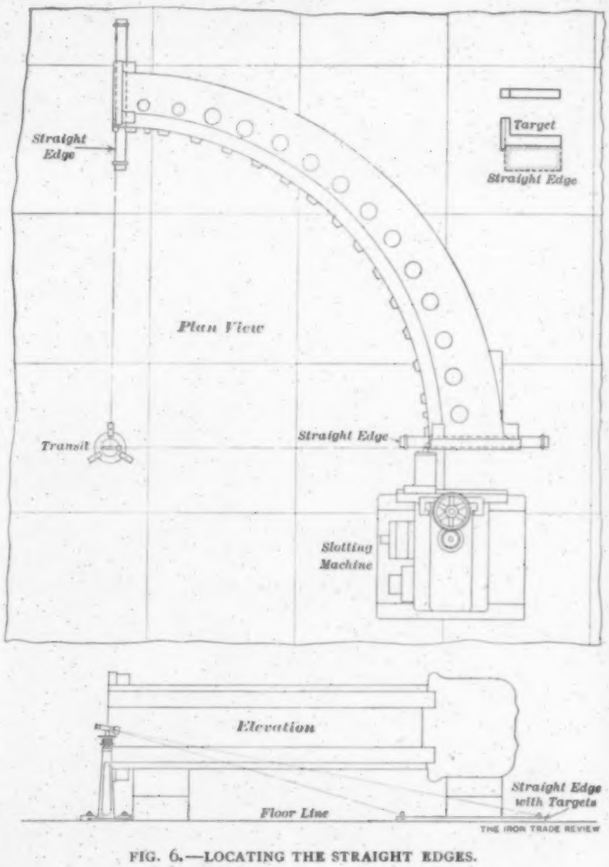


FIG. 6.—LOCATING THE STRAIGHT EDGES.

joint surface, it is advisable to scratch a finish line on the rim section at each joint, but the setting of the tool for its finishing cut is more easily and accurately made by the use of the telescope of the dividing instrument than by any other plan yet tried.

Before setting the tool for the final finishing cut it may be thought advisable to prove the surface of the last cut—a much simpler matter than at first appears. Let us suppose the last cut has left two-hundredths inch stock to be removed and that we have a target with a center line adjustable in a line parallel with one edge. By resting the edge of the target against the surface and adjusting its center line until it exactly cuts the center of the cross lines of the telescope when set at the correct angle, we can survey the joint surface and prove that it is or is not parallel with what is to be the finished joint surface. If the surface be found correct, the finishing cut can be made at once; if there be an error, proper adjustment of the portable slotter must be made and the joint surface again surveyed after taking a light cut. The ac-

curacy of the finished joint surface can easily be determined by the dividing instrument with suitable targets.

If the keyway is to be cut parallel with the face of the rim section, the operation can be performed by a portable horizontal milling machine or a portable slotter having a horizontal movement to the tool slide—the correct setting of either machine to be governed by the straight-edge attached

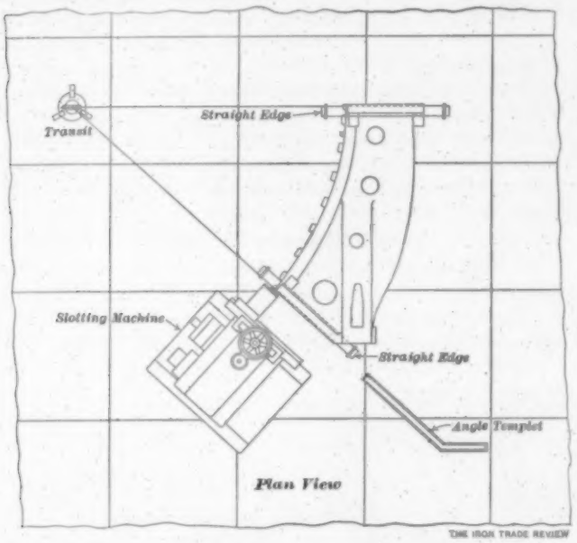


FIG. 7.—SETTING THE SLOTTER BY ANGLE TEMPLATE.

to the floor plate, and the exact vertical location of the keyway determined by a surface gauge.

If the keyway is to be cut parallel with the axis of the rim section, the portable slotter can be used advantageosuly and the exact distance of the keyway from the center of the ring

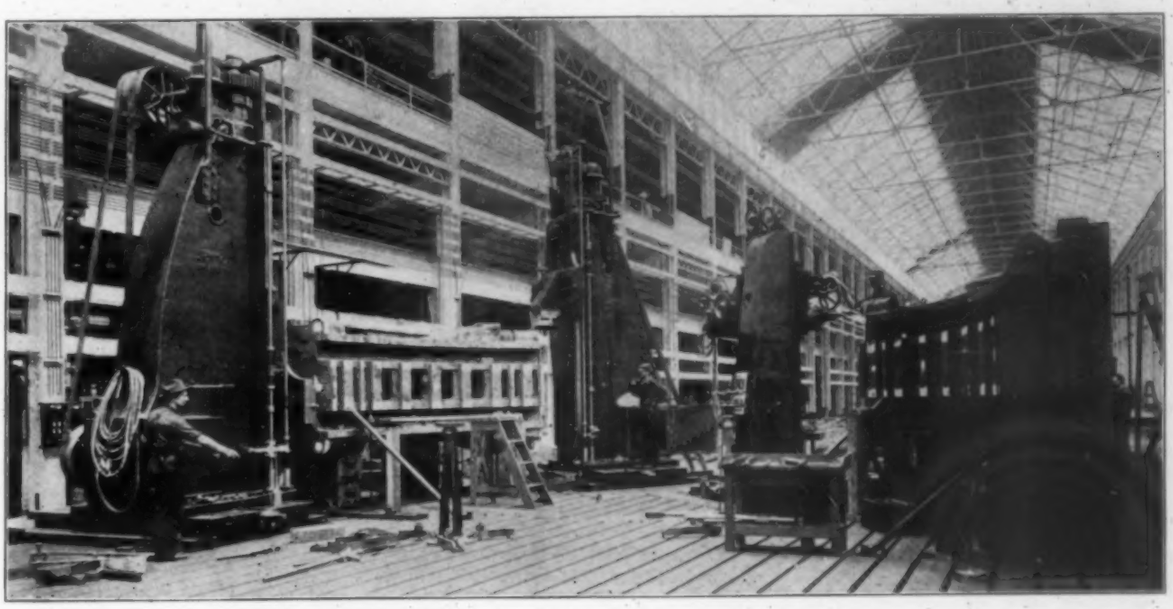


FIG. 8.—PLANING AND DRILLING THE SECTION JOINTS.

determined by a pin gauge calibrating from the tool to a pin inserted in the taper hole of the center column.

The axes of the bolt holes should be perpendicular to the joint surface, and they can easily be made so if the front edge of the portable horizontal drilling machine be perpendicular to the travel of the spindle and the base of the machine set parallel to the straight-edge attached to the floor plate. The exact position of each hole is better determined by a jig located by the keyway and a scratched center line; but if the jig is thought too expensive, the holes can be quite easily laid out in the usual way.

For each of the other five sections the same process should be gone through, and it will be found much easier to adjust the center column and straight-edges than to attempt to locate each section.

Testing Portable Machine Tools.

By the aid of the dividing and levelling instrument it is easy to test the accuracy of portable machine tools. In the case of a portable vertical slotter the vertical travel of the tool slide can be determined by setting the instrument so that the cross lines of the telescope exactly cut a line drawn upon the tool block when at its lowest position. Elevate the tool slide to its highest point, tip the instrument, and note the position of the line on the tool block in relation to the cross line of the telescope. If the tool travel is in a line perpendicular to the base, and the instrument has been properly levelled, there will be no variation in the reading. If the tool travel is not perpendicular, the instrument indicates the error, and correction can be made in the portable tool itself or shims can be used under the base to correct the error. To test the parallelism of the traverse travel of the tool slide with the front edge of the base of the machine, set the front edge of the base parallel with a straight-edge secured to the floor plate in a surveyed position—one edge of the straight-edge being approximately perpendicular to the tool slide. Adjust the tool slide until it is exactly perpendicular to the straight-edge by the scratched line as determined by the telescope. A transverse movement of the tool slide to its near and far position will indicate any error; if one be found, it is best to correct the machine by planing or scraping, as may be necessary.

To test the spindle travel of a portable horizontal drilling machine, set the instrument to cut the line of a target attached to the end of the spindle, and survey the spindle in its different horizontal positions. The vertical travel of the spindle slide can be determined by locking the spindle in one position and moving the slide up and down, the same as for testing the slotter. Other portable machines can be tested by similar means, and the result of the tests can be depended upon if the instrument is accurately made and the errors in the subdivisions of the circle are known.

Practical Application of the Method.

The method described has been practically applied to some of the mechanical operations incident to the manufacture of the eight 5,000-kilowatt, alternating current, engine type, 3-phase generators built for the Manhattan Railway Co. by the Westinghouse Electric & Manufacturing Co. The approximate dimensions of some of the principal pieces of one of these generators are as follows: The extreme height from the bottom of the bed to the top of the yoke is 42 feet, and the

the greatest horizontal distance over all is 44 feet. The bed plate, 43 feet long, has two parts, securely keyed and bolted together, each 21 feet 6 inches long by 10 feet 3 inches wide by 2 feet thick.

The stationary element, or armature, has six principal sections—two lower, two middle, and two upper—all securely keyed and bolted together; the bore being 34 feet, approximately. The revolving element, or field, consists of many pieces, the principal ones being the cast-steel hub, the two web plates of six pieces each, and the four ring sections. The diameter of this element is 27 feet 8 inches over rim sections, and 32 feet over all.

The total weight of the stationary and revolving elements of this machine (without the shaft) exceeds 1,000,000 pounds, or 500 tons.

After the preliminary design of these machines had been determined upon, it was apparent that the buildings, traveling cranes, and machine tool equipment then in service at East Pittsburg were inadequate for the work. A new building was therefore erected, and electric traveling cranes were provided, having ample capacity and mounted on runways of sufficient height to give the crane-bridge the necessary clearance over the top of the generators. It was also apparent, after carefully studying the design, that some of the machining operations could best be performed by the use of portable machine tools, while for others stationary machine tools would do the work more advantageously.

For the operations to be performed by portable tools, and for the erection of the machines, a surface floor plate was considered a necessity, and the one provided is 48 feet wide by 176 feet long; weight, about 2,000,000 pounds. This floor plate consists of 132 cast-iron sections, each 8 feet square, of box section heavily ribbed, keyed, and bolted together—provision being made for the removal of any broken section, should such a mishap occur. The plate, well grouted, rests upon transverse brick piers 12 feet deep built upon a solid bed of concrete, about 3 feet 6 inches thick. The brick piers are 4 feet apart, center to center, tied together at suitable distances by brick arches, and the space between the piers is filled in to within 5 feet of the under side of the cast iron plates. The filling between the piers is covered by a layer of concrete, having enough pitch to properly drain into a longitudinal tunnel at one side of the plate. There are numerous rows of drilled and reamed holes for stop lugs, and tee slots extend the whole length of the floor plate, with numerous cored holes at the bottom of the slots to permit the chips to fall through into the transverse tunnels. The longitudinal tunnel has numerous trap doors through which the chips can be taken out, and by a suitable sewer connection it is possible to thoroughly clean, wash, and drain this tunnel whenever necessary.

The principal portable machine tools used were vertical slotters or planners having a stroke of 8 feet, a small horizontal adjustment of the tool slide, a transverse tool travel of 4 feet—the column having a horizontal adjustment of 4 feet; horizontal drilling machines having a vertical adjustment of 8 feet, the column a horizontal adjustment of 4 feet, with spindle travel of 4 feet; vertical slot milling machines, radial drills, and small vertical slotters.

The principal stationary machine tools were a 14-foot planer, 8-foot open-side planer, radial drills with 10-foot arm, 16 to 24-foot and 16 to 36-foot extension vertical boring and turning mills, 28-foot vertical boring and turning mill, 122-inch engine lathe, a special floor-boring machine carrying portable heads, and several smaller machines.

The Stationary Element.

The bottom and top of bed plates were planed on the 14-foot planer; the joint surface and keyway on the open-side planer, and the joint bolt holes were drilled on the floor plate with portable horizontal drilling machines.

The bottom sections were the most difficult to machine, and a more detailed description of some of the operations on these pieces will make it unnecessary to outline so fully the operations on the other sections. The lower or perpendicular joint is at right angles to, and the upper joint has a portion parallel to, the bottom or base—the remainder of the upper joint being at a definite angle from the lower joint. The rough casting was mounted on the floor plate, resting on cast iron blocks, the bottom being set approximately perpendicular to the plate, as shown in Fig. 6.

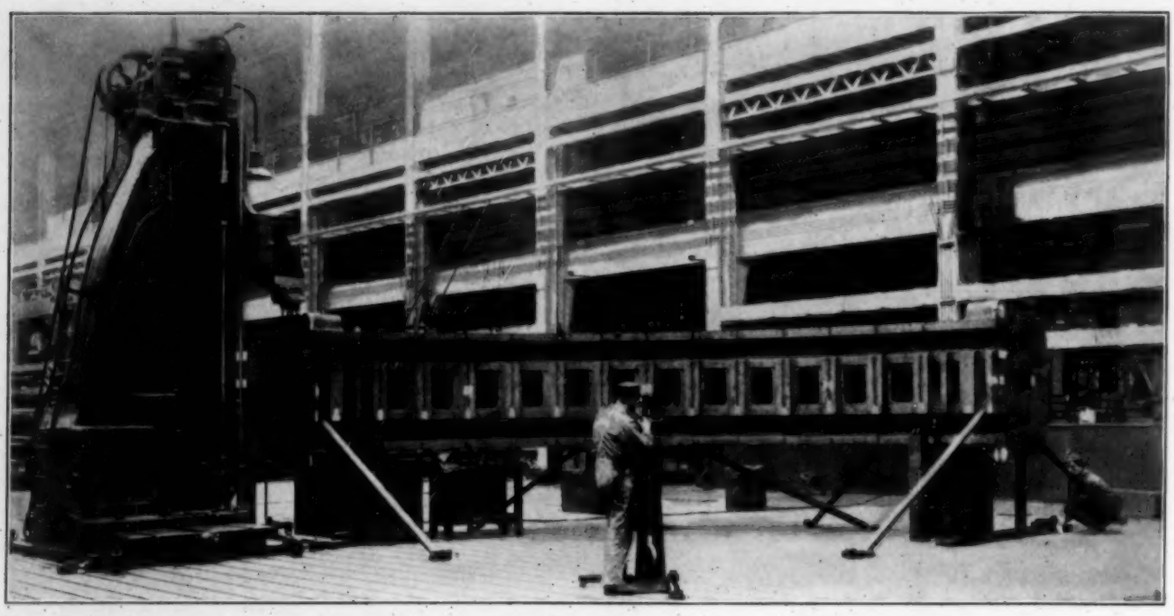


FIG. 9.—LOCATING STRAIGHT EDGES.

The proper location of the section involved the making of numerous measurements to insure plenty of stock for finishing—this being particularly necessary for the slot lugs located in the bore. The center column was mounted on the floor plate and its position determined by the centering gauge, as shown in Fig. 5—more or less proof testing being necessary to insure its exact location, after which it was securely clamped to the plate. The perpendicularity of the faces of the slot lugs was determined by scribing lines upon the top surface of the slot lugs with the center gauge at the proper elevation and by lowering the center gauge rest or support similar lines were scribed on the bottom surfaces of the slot lugs—scale measurements being accurate enough to prove this setting, after which the bottom section was bolted to the floor plate. The dividing instrument was then mounted upon the column, properly levelled, and finish lines scribed at each joint surface.

Straight-edges were then secured to the floor plate in their

exact position—one edge of each being set exactly perpendicular to the desired finished joint surface, the position of these straight-edges being determined by the dividing instrument and suitable target, as shown in Figs. 6, 7, and 10.

After providing the exact position of these straight-edges, the portable slotters were set in their correct location, secured to the plate, and the roughing cuts taken—slotters often working upon both joints at the same time. The accuracy of the rough planed joint surfaces was proved by the dividing instrument and an adjustable target, after which the cutting tool was set by the instrument for the final radial finshing cut. For that portion of the upper joint of this section parallel to the bottom, the slotter was set by the aid of the angle template, shown in Fig. 7—a pin gauge proving that the tool slide was parallel with the angle template.

The joint bolt holes were drilled by portable drills, the position of the bolt holes being determined by the use of drill jigs located by keys and by a center line. The drill jigs were made reversible for drilling holes in the faces of the corresponding joint surfaces of the connection sections.

After completing the operations upon the joint surfaces, the lower sections were finished upon the bottom on a stationary planer, as shown. The next operation was the drilling of the bolt holes and the drilling and tapping of the adjusting screw holes in the bottom of the section under radial drills.

The operations upon the joint surfaces of the middle and upper sections were laid out and finished in substantially the same manner as were those on the lower section; some of them being shown in Figs. 6, 7 and 10.

First Assembling of the Stationary Element.

After finishing all the principal operations upon the joints of the six sections, the two lower sections were placed in position on the floor plate and the lower joint bolted together. The two middle sections were next placed in position and securely bolted to the lower sections. After assembling the two lower and two middle sections of the first generator, it was thought advisable to survey the surfaces of the upper joint of the middle sections to be sure that they were level and in exact alignment with the center of the machine. These surfaces were found to be so accurate that surveys of the same were not considered necessary on succeeding generators.

One of the upper sections was next placed in position and securely bolted to one of the middle sections. As the joint of the upper section were planed at an angle of 90 degrees, and as the bore was 34 feet, the distance from the inner edge of the horizontal joint to the center was 17 feet. If there were not any deflection the vertical joint would have been exactly in alignment with the vertical joint of the lower section, but it was found that the upper joint over-hung six-hundredths inch in the first generator, and the over-hang in the succeeding seven generators in no case exceeded eleven-hundredths inch. The total variation between the generators, therefore, was five-hundredths inch. The amount of over-hang was determined by the use of a plumb line—the elevation of the surveying instrument not being sufficient to permit its use.

The second upper section was next placed in position and first securely bolted to the middle section. After this was done an examination of the upper joint was made, and it was found that a very thin piece of sheet steel could be inserted at the lower edge of the joint, while it was tight at the upper edge. When the bolts were put in place and well tightened the joint was absolutely tight all over, and tests with the plumb line showed the joint to be exactly in alignment with the vertical joint of the lower sections. The variation in the alignment of the vertical joints of eight generators did not exceed three-hundredths inch.

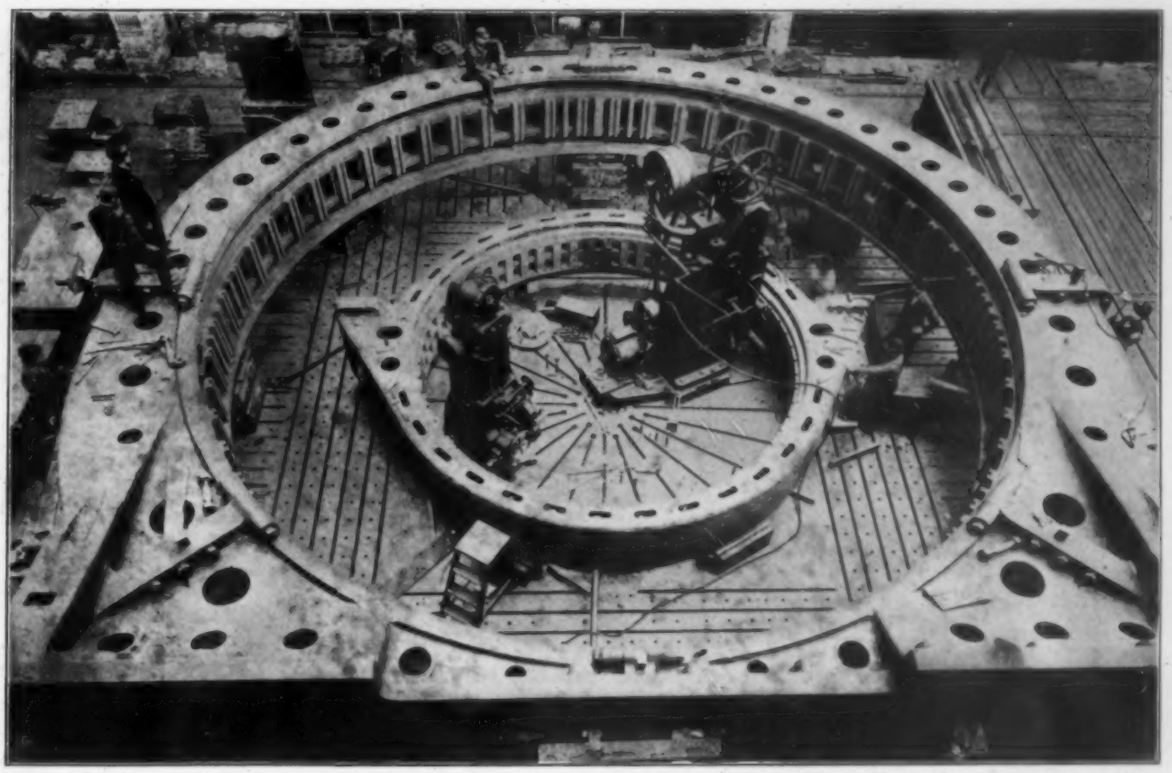


FIG. 10.—ASSEMBLING AND FINISHING STATIONARY ELEMENT.

Careful measurements of the vertical diameter were made before the second upper section was put in position, and in every case but two it was found, after placing the second upper section in position, that the tightening of the bolts of the upper vertical joint actually increased the vertical diameter by an appreciable amount, although not exceeding five-hundredths inch in any instance. This result seemed to prove quite conclusively that no errors had been made in laying out the work or in planing the joint surfaces. It also proved to those responsible for the work that the method was practical, and that the dividing instrument could be relied upon for accurate results. After assembling the six sections and making proof measurements, the work of chipping the edges of the joints, broaching the sides of the keyways, and fitting the keys was performed. Careful measurements of the hori-

zontal and vertical diameters were recorded, and then the frame was taken apart.

Second Assembling of the Stationary Element.

The six sections were next assembled on the special floor-boring machine—the axis of the bore being in a vertical position (see Fig. 10). This boring machine is 48 feet square and has a rotating table over 18 feet diameter, carrying various portable tool heads, which, for large work, are supported on arms having sufficient radial adjustment to bore up to 40 feet diameter. The driving mechanism is entirely under the floor, with operating levers at the side of the machine. Current for driving the motors operating the feed mechanism of the portable tool heads is carried up through the center of the rotating table, where connection can be made by flexible cables.

The assembling of the six sections followed in the order of the first assembling. The lower sections were positioned by a heavy angle-plate securely fastened to the boring machine, which determined the exact distance from the center to the bottom of the generator. After the sections were properly blocked and bolted together, careful measurements were made of what were the vertical and horizontal diameters when the sections were first assembled. In each case it was found that the former vertical diameter had increased twelve-hundredths inch and that the horizontal diameter had not changed materially, showing that most of the deflection was in the upper section. By numerous heavy braces and taper wedges the upper sections were sprung toward the center until the diameter corresponded with the diameter recorded during the first assembling. The frames were then bored, faced, and recessed to the required dimensions. The dovetailed slots for holding the sheet steel laminations were planed and milled—the spacing of these slots being determined by the table of the boring machine.

The table was graduated as follows: In the edge of the table there were 360 holes drilled one-quarter-inch diameter, into which were driven brass plugs. The edge of the table was slightly recessed and the brass plugs faced to protect them from injury. The dividing and levelling instrument was mounted upon a column accurately fitting into a recess in the center of the table, and a target was set up at quite a distance away. The subdivisions of the circle were obtained by rotating the table until the cross line of the telescope exactly cut the line on the target for each degree—the line then being made on the brass plug by a special graduating fixture attached to the bed of the machine.

After the operations were all performed on the frame the six sections were taken apart. The sheet-steel laminations, ventilating plates, end plates, and clamping bolts were next assembled with each section of the stationary element.

The end plates for clamping the sheet steel laminations were made from steel castings and were 35 feet 4 inches outside diameter, with 16 inches face. These plates were turned on a 36-foot extension vertical mill. The end plates were carried on plates mounted upon twelve outriggers bolted to the 14-foot table of the mill. To these outriggers were attached adjustable shoes resting on an angular bearing 29 feet diameter, which gave sufficient support to the outriggers and relieved the table of undue strain. The driving mechanism for this mill was the same as in a 16 to 24-foot extension mill and was not of sufficient strength to permit of taking heavy cuts.

A worm-gear drive was recently provided having somewhat unusual sizes. The cast iron worm gear has 180 teeth made in 12 sections having 15 teeth each; pitch diameter, 33 feet 5 inches; face, 13½ inches. The twelve sections are securely bolted together and bolted to the outriggers. The worm is of cast iron, 20 inches diameter, 20 inches long, 7 inches pitch, single thread of involute rack tooth form, 30 degrees included angle. The worm is driven by suitable gearing and runs 30 to 63 revolutions per minute, driving the table one turn in 8¾, 6, 4, and 3 minutes; cutting speeds, at 36 feet diameter, 13, 19, 28, and 37 feet per minute.

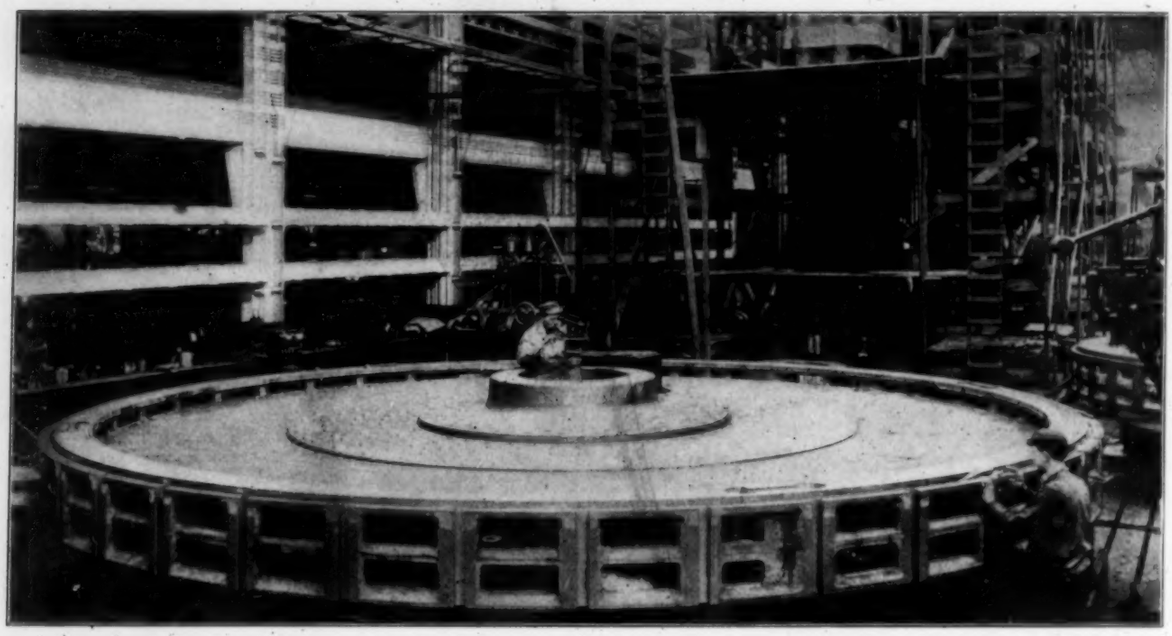


FIG. 11.—SUBDIVIDING THE REVOLVING ELEMENT.

The Revolving Element.

The dividing and leveling instrument was used only on the rim-section joints and to subdivide the circle for the dovetailed slots. The joints were made by the same means as used for the stationary element sections. The operation of subdividing the circle is shown in Fig. 11, in which the instrument is mounted on a center column and the lines are ruled on brass plugs by a special graduating device.

The instrument in daily use at East Pittsburg was designed and made by the Warner & Swasey Co., of Cleveland, who kindly furnished the writer with the following description: "The knurled base on which the instrument rests is provided with an internal thread for screwing it to the cap of a tripod; or, if it is preferred, a supplementary base can be screwed to it, the latter being provided with a taper hole for readily centering the instrument on a suitably designed cast-iron column. The knurled base has four leveling screws, by which the body of the instrument is attached, the usual supporting ball and socket joint being provided in the center between the two.

"In the center of the instrument are two vertical spindles, the one fitting inside the other. The outer spindle carries the horizontal circle independently from the inner spindle, which carries the supporting yoke and the telescope. The circle is

provided with clamps and slow motions, so that its 0 division can be brought to any position in azimuth, and there clamped independently of the telescope. The circle is 12 inches outside diameter, and is provided with an inlaid silver strip or band one-quarter inch wide divided into one-sixth degrees, which are read by vernier and reading microscope to ten seconds. The circle also has a second series of graduations, which are read by two opposite microscopes, with a magnifying power of twenty-four, direct to one-tenth degree.

"The yoke is mounted on the inner spindle and is provided with clamps and slow motions, so that the telescope can be moved to any azimuth position relative to the circle and independently of it. It has two 2-minute horizontal levels, 90 degrees apart, for quickly setting the instrument. The telescope rests in a cradle so arranged that it can be revolved about its long or optical axis, the cradle resting in Y bearings, which are reversible for collimation, the line of collimation being perfect from a distance of 10 feet to infinity.

"The telescope has an objective one and one-half inches in diameter, a focal length of eleven inches, and gives, with two eye-pieces, magnification of 15 and 22, respectively. The eye-piece has the usual cross wires and focusing adjustment with rack and pinion. The cradle trunnion carries a slow-motion arm, which can be clamped at any position for accurate altitude setting. The striding level is seven and one-half inches long, has an air chamber and divided scale, one-tenth-inch bubble travel being equivalent to 10 seconds of arc."

Mr. Swasey has stated to the writer that the greatest error in the subdivisions of the circle of this instrument would not exceed one second of arc—an amount equal to 0.3072 inch at a distance of one mile. So many uses have been found for the instrument, and it has proved so valuable, that a second one was recently ordered to be on hand in case of accidental injury to the one now in service.

Tremendous Demands of Railroads.

The activity in plants which manufacture equipment for railroads is one of the most notable features of the industrial world today. Six complete locomotives are now turned out daily at the Baldwin Locomotive Works, but even with this supply the demand for motive power by the various great railway systems cannot be met. John H. Converse, president of the Baldwin company, says the present condition of affairs is unprecedented. The demand for motive power by the railroads does not seem to slacken. The works employ 13,000 men.

The Baltimore & Ohio road paid other railroad companies a premium to get their places on the order list at the Baldwin works for the locomotives so as to secure the use of them at the very earliest date. The Baltimore & Ohio has 200 new locomotives ordered. The contract calls for the delivery of 100 during March, April and May, and 100 during September, October and November. In each order there are to be 75 freight locomotives, 10 Atlantic type passenger engines and 15 heavy switch engines. When these orders are filled the company will have about 1,700 locomotives, of which about two-thirds will be for hauling freight.

A number of companies which will manufacture railroad material or build railroads have been incorporated within a few days in New Jersey. Among the number are the following: the New York Railway & Supply Co., capital $250,000, will manufacture and deal in railroad cars; the Union Construction Co., capital $250,000, will build railroads; the International Shoe Brake & Foundry Co., capital $150,000, will manufacture railway equipment; the Eastern Electric Contract Co., capital $100,000, will do a general engineering business; the Railway Improvement Co., capital $1,000,000, will manufacture all kinds of railway equipment and supplies.

The Franklin Steel Works, which manufacture toe calks, are moving their machinery from the Boston plant to the new location in Joliet, Ill. A structure 208x60 feet, formerly used as a wire mill, will be used.

The Rogers Screw Co., Providence, R. I., is putting in a new steam plant of Stirling boilers. The company is very busy.

REBUILDING THE CANAL DOVER SHEET MILLS.

That part of the plant of the American Sheet Steel Co. at Canal Dover, O., which was destroyed by fire several months ago, will be rebuilt and other improvements will be made, the total expenditure being from $150,000 to $160,000. All contracts have been placed and work has commenced. A new steel building 280x130 feet will be placed over the three sheet mills and plate mill that were damaged. An electrical traveling crane of 30 tons capacity, 1,000 horsepower Babcock & Wilcox boilers, automatic stokers and all known contrivances for improving methods will be installed. The mills are substantial and stand upon a new foundation. Yard tracks will be changed and the roofing department will not occupy its old site. The new roofing works will be constructed of steel frame, filled in with brick, and will be absolutely fire proof.

It has been definitely decided to make Canal Dover a permanent center for the manufacture of black and galvanized roofing products in immense variety, including metal ceilings and fire proofing lath, etc. The plant erected for this purpose will be so located that steel sheets will pass from the annealing furnaces directly to painting machines at one end of the building and at the other end galvanized sheets will pass from the pots to forming machines. It is a simple process capable of great saving in labor costs. The main building will be 500x60 feet, and painting shops will be about 300x50 feet. No expense will be spared to make the plant the most perfect in the world. The capacity will be 100 tons finished product per day. Twenty railroad cars can easily be loaded in one day with the facilities at command. All contracts have been placed and work has commenced. The company are not in the market for any supplies of any description.

When these improvements are completed, about May 1st or sooner, the Canal Dover Works will consist of nine sheet mills, one plate mill, galvanizing works and roofing factory. The total number of men required will be 650. The New Philadelphia mills of the same company are only three miles distant and employ about 425 men. Both plants are in Tuscarawas county, with two lines of street cars running between the towns. When business improves it is safe to say that each of these works will be operated full time. At present there are not enough specifications to go around. The workmen of Canal Dover are non-union, while those at New Philadelphia still cling to the Amalgamated Association. Subscriptions from both places to the profit sharing plan of the United States Steel Corporation are large. We are informed that over 35 percent of all the workmen now in good standing subscribed for all the shares to which they were entitled and elected in most cases to pay the full amount they are allowed to pay, 25 percent of their earnings per month. Another remarkable success in this district is the "Dover Reading Rooms," established six months ago in a building formerly occupied as a saloon. There is one large reading room where newspapers and periodicals are furnished. In this room the men are allowed to play checkers, dominoes and similar games. There are also a room for smoking, a room for writing and two rooms occupied as a library. A. Beard, division superintendent, Canal Dover, is the father of the institution, and rules it with a liberal but firm hand. It has done great good for young men who are away from home and have no place to go. The expenses of maintenance are at present fully covered, but books are badly needed. As soon as a sufficient number are received members will be allowed to borrow the volumes under regulations that will protect the institution from loss.

Many newspaper articles have recently been published referring to blast furnaces, steel works, and other plants to be built in Utah by F. H. Buhl and P. L. Kimberly. In response to an inquiry, Mr. Buhl informs us that there is no foundation for these stories.

At a meeting of the directors of the Kelly Nail & Iron Co., held last week, it is understood that an annual dividend of 100 percent was declared on a capitalization of $225,000. The time for the payment of the dividend was left to the president, and Mr. Richey stated last Thursday that no time had as yet been fixed.—[Ironton (O.) Register.

Design and Construction of Machine Shops and Foundries.*

BY J. H. HUMPHREYS.

Several firms have attempted to alter and adapt a workshop which has been built for one branch of engineering, in order

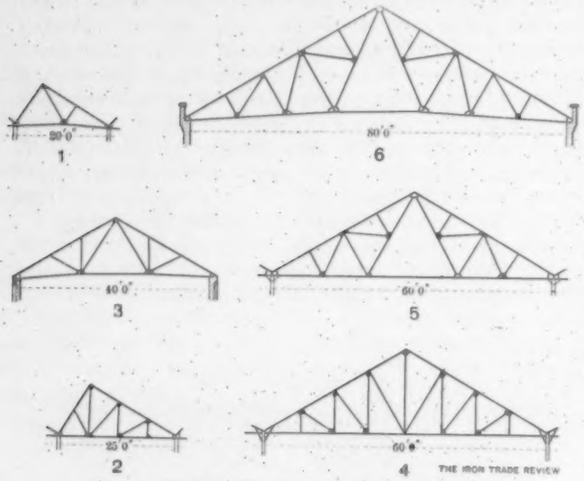


FIG. 1.—TYPES OF ROOF GIRDER CONSTRUCTION.

to utilize it for a different class of work. The process is a costly one, and the result generally unsatisfactory, especially so far as output is concerned. It is too often assumed that it is only necessary to put up four walls and a roof, and that the rest may be fitted in afterwards to make the workshop complete. In looking over many of the old foundries and machine shops, it seems surprising that such a large amount of good work has been produced under the worst conditions of lighting and cleanliness. It certainly bears testimony to the patience and perseverance of the workmen of fifteen or twenty years ago.

The chief point which we should all have in view when building workshops is to construct them in such a manner that we may obtain a maximum output of work at the most economical rate. Each building must be so designed and constructed that the various machines may be located in a position suitable for dealing with their work, and cranes and other apparatus installed for handling it expeditiously and economically. The size and weight of materials to be manufactured, also the sizes of the various machines, must be carefully

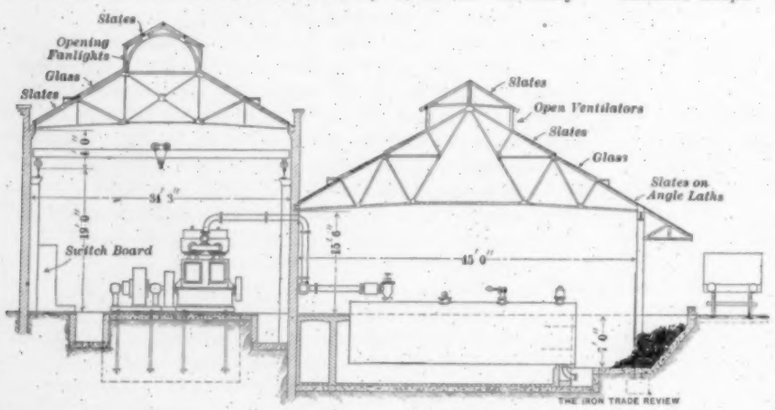


FIG. 4.

borne in mind, and the height and width of the shop, and spacing of the supports, must be arranged accordingly. The stanchions and girders of the structure should be arranged to carry the roof and galleries and support the side walls, and should also be constructed to support the traveling cranes, jib cranes, shafting, and other equipments, thus avoiding the necessity of introducing additional supports and framing to carry these after the main structure has been completed. This point is often overlooked before starting the building, with the result that extra expense is incurred in adding members for this purpose, but which generally interfere with the handling of the work.

In the illustrations are shown several suggested cross sections and plans for the various shops of an engineering establishment. The buildings shown include the engine and boiler house, foundry and fettling shop, machine shop and erecting shop, and are referred to later.

No general plans have been given showing the relative positions of the buildings to each other, as these, of course, must be set out to suit the site. The general arrangement of the shops requires the most careful consideration in each case before the further details given in the paper can be dealt with. Owing to the introduction and increasing use of electric driving, however, some of the difficulties in connection with this have been removed, as it is now no longer necessary to place the engine-house in a central position for transmitting power by means of shafting, ropes, or belts, to the various shops.

Advantages of Steel.

For stanchions, girders, roof principals, and other framing, mild steel is most suitable. In Fig. 1 are shown various forms of roof girder construction, as adapted to saw-tooth monitor and other descriptions of roofs. The steel stanchions are built up in various sections, the most common forms being shown in Nos. 1 to 11, Fig. 2. The compound stanchions in Nos. 7 and 8 are often arranged so that the line shafts may be carried through them, thus enabling the machines in the bays on each side of the stanchions to be conveniently driven

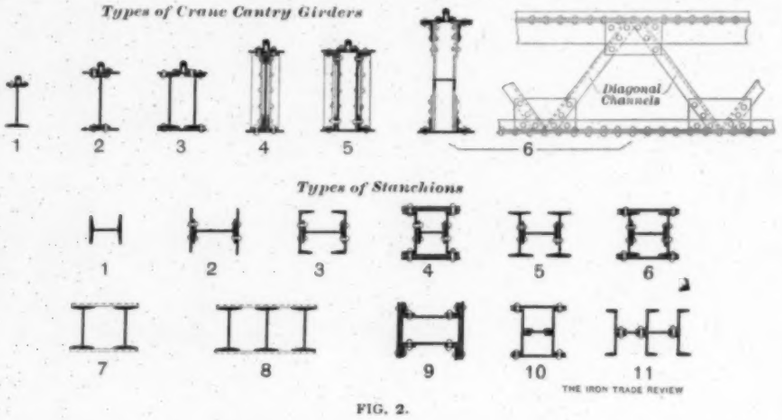


FIG. 2.

from these, as shown in the illustrations of large and small machine shops. They are also suitable for carrying the heating or ventilating pipes in such a position as to cause little obstruction. Most of the sections given are suitable for supporting jib cranes and additional shafting girders, which may be easily attached for carrying the brackets supporting the bearings of the main or counter shafting in the machine shop. Nearly all these sections shown are better adapted for their work than cast-iron stanchions, as they are able to bear unequal and heavy loads, and are not liable to fracture from shock. They take up less room in the shop, as the width may be considerably less than if made of cast iron.

The sections Nos. 4, 6, and 9 are the most suitable where it is desired to attach jib cranes to the sides, or support the crane gantry on brackets, as they are able to withstand the bending moments due to overhanging loads, the moment of resistance on both axes of either of these sections being approximately equal. The sections 10 and 11 are used in many shops in the United States, and many of our members will no

*A paper read before the Manchester (Eng.) Association of Engineers.

doubt have noticed some of similar section at the Westinghouse Works in Trafford park.

Crane Gantry Girders.

It is of the utmost importance that we should have a good crane track, in order to suit the requirments of the modern quick traveling electric cranes. The girders forming the track should have a depth of at least 1-15th of the span, and have sufficient lateral stability to prevent any side swinging of the crane when traveling quickly with its maximum load. The width of the girder should not be less than 1-30th of the span, unless it is connected to some other rigid member of the structure. In determining the sizes of these girders it is convenient, for the purpose of calculation, to assume an equivalent dead load of at least one and a half time the rolling load for large-span cranes, and twice the rolling load for small-span cranes. Under these conditions the factor of safety may be taken as 4. The joints of the girders should have good covers, and the top flange or web of the girders should be securely fixed to the stanchions to prevent oscillation. In addition to forming part of the equipment of the shop, these girders act as a longitudinal stay to the stanchions.

I think many crane tracks are spoiled through using too light a section of rail. A heavy rail can be laid much truer, and will last longer and give less spring at the joint. A bridge rail of good depth and width should be used for all heavy cranes, the flat bottom rail being only suitable for light power or hand cranes. Great care must be taken in laying these straight and level, in order to ensure the smooth running of the crane, while the joints of the rails should overlap those of the girders by at least 18 inches. In many cases it is better to send the rails loose, and after the girders are fixed to mark off the holes and drill at the site in order to ensure a perfectly straight line, thus avoiding loss of power and reducing the wear of the crane. Nos. 1 to 6 in Fig. 2 show various forms of crane-gantry girders. Nos. 1, 2, and 3 are generally used for short spans, and Nos. 4, 5, and 6 for long spans.

Floors and Floor Girders.

In considering the construction of the machine or erecting shops, it would be difficult to find a portion which presents a greater variety than the construction of the floors. The number and variety of the materials used to form the ground floor of a workshop are really astonishing. The kind of floor should of course depend upon the class of work and the weight to be handled. It is essential that we should get a regular and level floor, which will wear well, will not chip or crumble, and one that will be comfortable for the men to work on. A wood face is usually preferred for this reason, but care must be taken to prevent the damp from working through, or the floors will quickly be spoiled. Many concrete floors covered with boards have had to be taken up owing to dry rot, especially in cases where a layer of asphalt or other damp-proof material has not been laid down. In Fig. 3 are shown three types of ground floors, which have generally given satisfaction. Type No. 1 consists of a bed of tarred ashes, well rammed, with timber cross bearers laid about 3 to 4 feet apart, and planks about 2½ or 3 inches thick spiked to these, the timber being first coated on the bottom and sides with a mixture of tar and pitch. Type No. 2 has a substratum of ashes, well rammed, with a concrete bed on top, and a layer of sand, on which wood blocks are laid on end, run in with pitch. Type No. 3 is a very strong floor, suitable for the heaviest weights, and consists of a lower bed of rubble concrete 4 or 5 inches thick, with a layer of rock asphalt ½ inch thick, and upper layer of coke breeze concrete, to which are spiked 2½-inch floor boards creosoted on the bottom. In a works where a high-class trade is done, such as loco, or stationary engines, machine tools, electric motors, etc., it is very necessary that a good floor should be laid, and in many cases it is worth going to the expense of having planks planed on the sides and the top. A well-laid floor contributes to the cleanliness and orderliness of the shop.

Three types of gallery or upper floors are also shown in Fig. 3. Concrete floors are generally adopted in these cases in preference to wood, owing to the incombustible nature of the materials and the freedom from vibration. Type No. 1 consists of steel joists of the requisite depth to suit the span, embedded in concrete with a layer of coke breeze concrete on top, to which the floor boards are spiked. In type No. 2 the steel joists are embedded in the same manner, with wood fillets on top spaced at suitable intervals, for the purpose of nailing the floor boards. Type No. 3: A wood floor composed of 7 by 2½-inch timbers packed together on edge, and 1½-inch floor boards. This makes a good fire-resisting floor, and is fairly steady, but is rather expensive. A cheaper floor is often used, consisting of the warehouse type of wood floor joists and one or two thicknesses of floor boards. It is generally found, however, that it is not free from vibration, and takes up considerable head room.

A number of sections of floor girders are shown in Nos. 1 to 5, Fig. 3. The sections 1, 2 and 3 are for small spans, whereas for large spans Nos. 4 and 5 are more suitable. The loads usually assumed on the gallery or upper floors are from about 2 to 6 cwt. per square foot, according to the nature of the work to be dealt with. The sizes and weight per foot of the girders suitable may be found by reference to some of the maker's lists. The depth of the girder should not be less than one-fifteenth of the span, the factor of safety generally allowed being 4. It is advisable to arrange, as far as possible, that all the floor girders and other members should be riveted up complete in the maker's works before being delivered at the

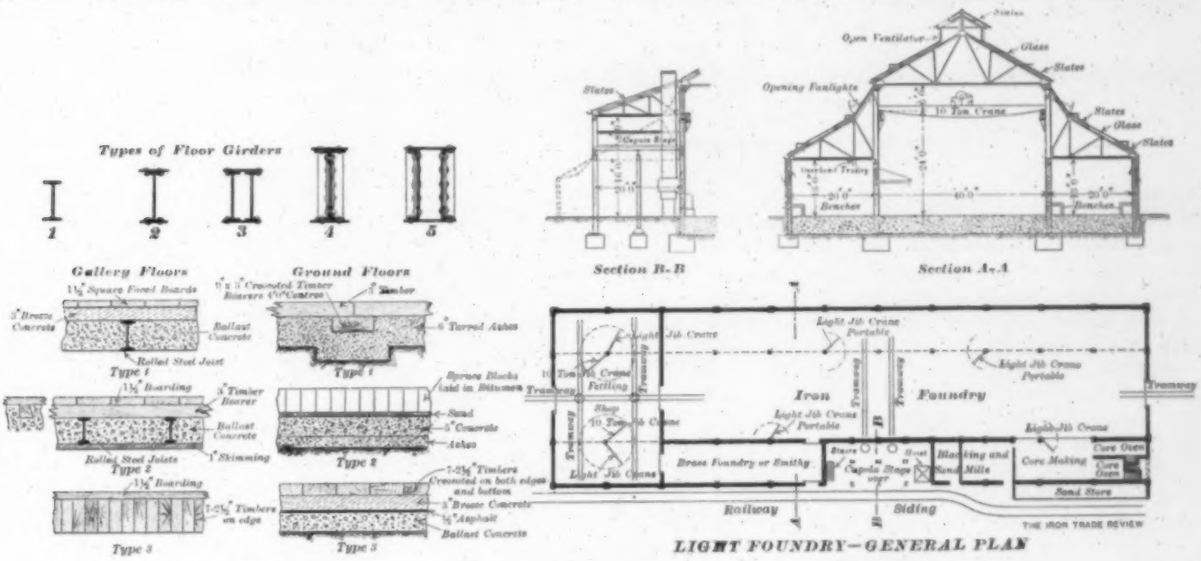


FIG. 3. FIG. 5.

site, in order to get the advantage of machine riveting, and to enable the work to be erected in the quickest possible time.

Engine and Boiler House.

The engine and boiler-house shown in Fig. 4 is a type suitable for a large engineering works. The engine-house roof here shown is constructed on more ornamental lines than the roof in the other parts of the works. The building is adapted for the installation of an electric generating plant, most of the engineering works recently erected being equipped with this. To meet the demand for additional power, the building

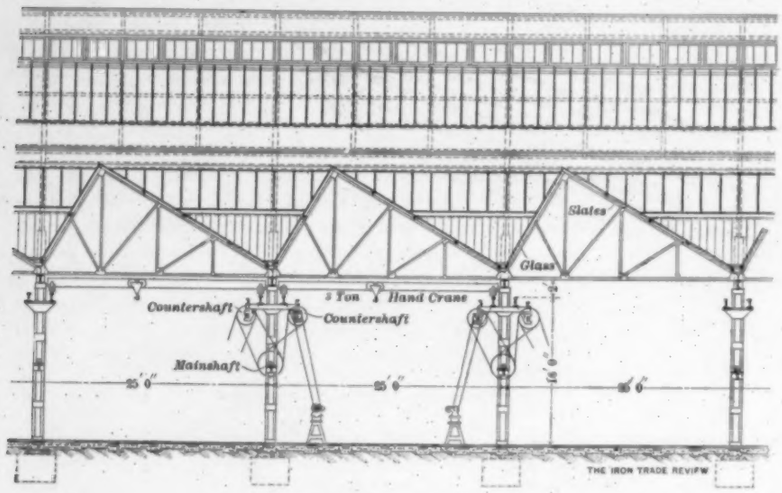


FIG. 6.—SECTION THROUGH ERECTING SHOP.

may be extended in the direction of its length without disturbing the existing plant. The best covering for this roof is slates, supported by boards, the boards being laid diagonally with a layer of felt on top. Provision is made in the lantern of the roof for the opening and closing of the fanlights, these being pivoted as shown, and worked by gearing from the floor. Both sides of the roof are glazed, in order to admit plenty of light, and it is advisable in this case to use wired glass supported on patent sash bars. The purlins supporting the slates and glass are of angle irons, with molded wood fillets pocketed in same. A hand-power traveling crane is provided, as shown, for the installation and repair of the engine or dynamo. The crane gantry may be supported on arches in the side walls, or the gantry girders may be carried by means of intermediate piers, as shown.

The principals over the boiler-house are of a heavier type. In many cases the lower members are composed of tee or double angles, in order to strengthen them for carrying the steampiping. It is advisable to avoid the introduction of woodwork as much as possible, and for this reason the slates are supported on steel angle laths, being secured with lead or copper nails. The roof is fitted with louvres of an open fixed type. A coal bunker of large capacity is arranged along the front, with openings on the firing floor opposite each boiler. The coal may be shot direct from the trucks into the bunker. Where wagons with hopper bottoms are available, it is more convenient to arrange rail girders, so that the trucks may be run over the bunkers. The steel stanchions at the front are arranged about 13 feet, centres, to support the roof and the side framing of the coal bunkers. No drawings of the pattern shop or pattern store have been made, as the constructional framing in these buildings does not call for special remark.

Light and Heavy Foundry.

The chief buildings in which steel construction may be used to the best advantage are the foundry and machine shops. In order to illustrate these fully, I have included drawings of two examples of each. In Fig. 5 are shown proposed cross sections and plans for a foundry capable of dealing with castings up to about 7 or 8 tons, while in Fig. 7 the outlines of a foundry for turning out much heavier work are shown. The whole of the constructional framing for both of these foundries is of steel, including the stanchions, roof principals, crane girders, purlins, etc., also the girders and floorplates for the cupola stage. The walls shown need only be made one brick thick for weathering, or as division walls between the shops, all the weight of the structure being supported by the stanchions.

The roof covering given for the foundry is slates on batten and spears, the glazing carried by means of steel or iron tee sash bars, while the purlins are composed of steel angles with wood fillets pocketed in. The louvres over main roof are of fixed type, and in addition to this, opening fanlights are placed at each side of the buildings, to allow the hot gases and dust to be got away quickly when required. Provision has been made for carrying the crane girders by means of brackets on the sides of the stanchions in the case of the light foundry, while in the heavy foundry the crane girders rest directly on top of the stanchions. Light portable jib cranes may be easily attached to any stanchions, as required.

In the heavy foundry the traveling cranes can handle material in any part of the heavy or light, moulding shop, fettling shop, core making and brass foundry, or smithy. In the light foundry the cranes will control the central bays only, the side bays, if necessary, being fitted with an overhead trolley rail, as shown. A good area of glass has been provided in the roof in order to admit plenty of light, and to enable the glazing to be cleaned when required gangways are rovided on each side of the roof. Most of our existing foundries are notably deficient in light, and very few of them ever get cleaned down.

Machine and Erecting Shop.

The two types of machine shops which I have selected for illustration are for heavy and light work respectively (Figs.

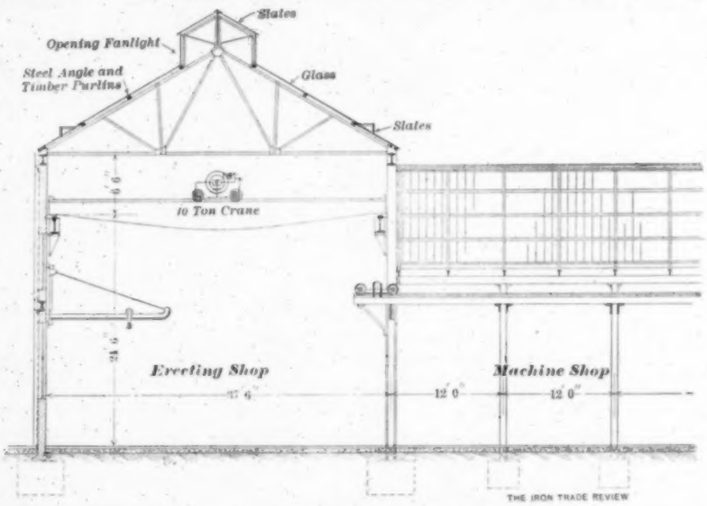


FIG. 6A.—SECTION THROUGH MACHINE SHOP, SHOWING ERECTING SHOP IN BACKGROUND

8 and 9). The erecting shops are conveniently placed in each case adjacent to these, so that the work may be easily conveyed from one shop to the other. It will be noticed that the whole of the skeleton steel framing is complete and self-supporting, so that this portion of the building may be finished before the bricklayers, joiners, slaters, and other trades commence the clothing or weathering, and will thus enable the building to be completed more rapidly.

In the light machine shop the roof is of the saw-tooth type with a north light, each of the bays being equipped with a

hand crane for lifting the work in or out of the machines, and for running it down to the erecting shop at the end. The erecting shop is of much larger span, and much loftier. The shop is equipped with an overhead electric traveling crane, and jib cranes may be attached to the stanchions where required, to assist in the erection of the work. The line shaft is carried down the center of each row of stanchions, and the countershafts hung from the crane girders, which are braced upper or gallery floor, which is for light work, and does not require the use of a traveling crane. As the stanchions are placed at much wider centers in this shop, it is necessary to provide shafting girders to carry the main and counter shafting between the stanchions. In shops where electric driving is used, the motors may be conveniently carried on the side of the stanchions, and may drive direct or by means of a belt on to the line shaft.

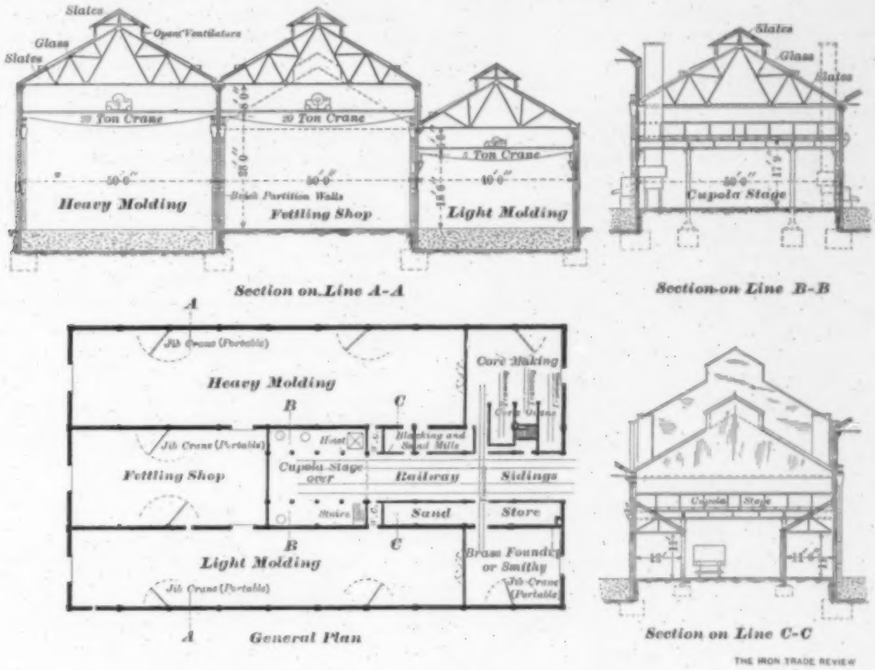


FIG. 7.—HEAVY FOUNDRY.

together. The machines are arranged at the sides of each bay, and are driven from the countershafts on each side, thus dispensing with any belts across the shop and giving a free passage for the crane down the center. The stanchions in the machine shop are similar to section 7, but are built up of channels instead of joists. The covering on the long slope of the roof is of slates, laid on boards and felt, supported on wood fillets in angle purlins. The steep slope on the northern

The floor girders are similar to No. 4, Fig. 3. The type of gallery floor recommended here is type 1, Fig. 3, and for the ground type 3, Fig. 3. It will be noticed that extensions may be made in the length or width of the shop without disturbing the roof, floor girders, crane tracks, or other framing, and without interfering with the manufacture of the work in hand. The walls suggested are only 9 inches thick, and are used as a protection against the weather. They do not carry

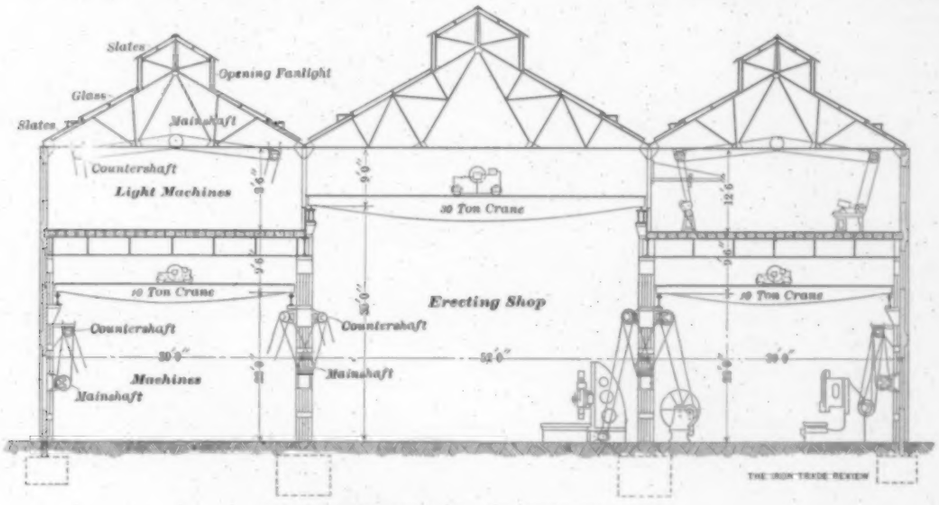


FIG. 8.—HEAVY MACHINE AND ERECTING SHOP.

side is covered with glass on patent sash bars. The covering of the erecting shop is similar, but with the glazing arranged on each side of the roof, as shown.

The floor suggested for the machine shop is similar to type 1, Fig. 3. The covering of the heavy machine shop is like that described above, but the steel framing throughout is of a much stronger type. The stanchions are similar to No. 8, Fig. 2. Electric cranes are shown in each bay, except the any load, the weight from the roof, floors, and cranes being carried by the stanchions.

Foundations.

The foundations for the stanchions will, of course, vary both in size and material according to the nature of the ground, making it impossible to deal with these in a short paper, but the most generally used are concrete blocks composed of five parts of broken brick or stone, one part of

sand, and one part of Portland cement, which is economical and usually satisfactory.

Conclusion.

It is no doubt a very uncongenial task for a manufacturer to have to pull down an old machine shop, in which he has spent many years of his life, in order to replace it with a new one, although he knows a modern one will allow of a considerably increased output and repay him for the cost and any temporary inconvenience he may be put to. Many, no doubt, postpone from year to year extensions or reconstruction of their buildings either with the excuse that they are too busy to undertake the work or that they are afraid the work in hand may suffer. It is unwise, however, to allow these reasons to stand in the way of a necessary and beneficial change. In a dark, dirty, and ill-ventilated workshop the output is necessarily low, the workmanship generally is of poor quality, and firms working under these conditions are seriously handicapped in the race for the first place in the trade.

Most firms have recognized the importance of scrapping obsolete tools, and have acted upon it, but there are still a large number in this country who do not appear to have grasped the fact that the shops in which their new machines are working are altogether unsuitable for quick output and accurate work. They have evidently forgotten the teachings of the old book and have "put new wine into old bottles."

Many members present, I am sure, can call to mind a number of workshops in the district which ought to have been dismantled and pulled down years ago. Many of these shops, unfortunately, are placed in congested districts, and are so situated as to prevent extension in any direction without incurring a very heavy expenditure in buying up the adjoining property. It would pay most of these firms who have an established business to sell their old property and build modern works on a new site to suit their requirements, where they would get an increased output at a lower cost, and have ground available for future extensions, besides improving the health and efficiency of the men. Additional capital would be required in most instances, but one need not fear for the result under the new conditions. A number of very good shops have been built in this country recently. Many of these are shown in the photographs which have been handed round tonight, and I wish to avail myelf of this opportunity of thanking the various firms for sending these in order to place before you.

A comparison is often made between the work shops of this country and America, pointing out the better lighting, ventilation, cleanliness, etc., in the American workshops. The reason, however, is not far to seek, as most of the American workshops have been built in recent years, and have consequently benefited by the experience gained in the older shops on this side.

Hans Hansen of Elk Rapids, Mich., will start a machine shop in connection with R. W. Round & Sons' foundry. Machinery has been purchased.

A FIRE PREVENTION CONGRESS.

An International Fire Prevention Congress will be held at Earl's Court, London, during the week commencing July 6, 1903, under the auspices of the British Fire Prevention Committee. The congress will hold both general and sectional meetings. There will be six sections: Building construction and equipment; electrical safeguards and protection from lightning; legislation and administration; fire survey and fire brigade patrols; insurance and fire losses; standards and tests for materials. Two days will be devoted to general meetings for the reading of papers and discussion. One day will be devoted to sectional meetings, each section working as a separate unit. A part of the time will be given to an inspection of the British Fire Prevention Committee's Fire Testing Station; to the examination of the exhibits of the International Fire Exhibition; to visits and excursions.

It is rarely that those interested in the prevention of fires meet in numbers for the interchange of information and the congress organized broadly on the lines indicated will in all probability excite much attention and the association of the persons engaged in this work as well as the record of the most practical results should ensure a decided improvement in the general purpose.

The main objects of the congress are enumerated as follows:

(1) To discuss the practice of building construction and the application of building materials from a fire preventive point of view; to compare the practice in different countries, and to inquire into the latest materials and systems of construction available, as also the latest inventions for the general equipment of buildings.

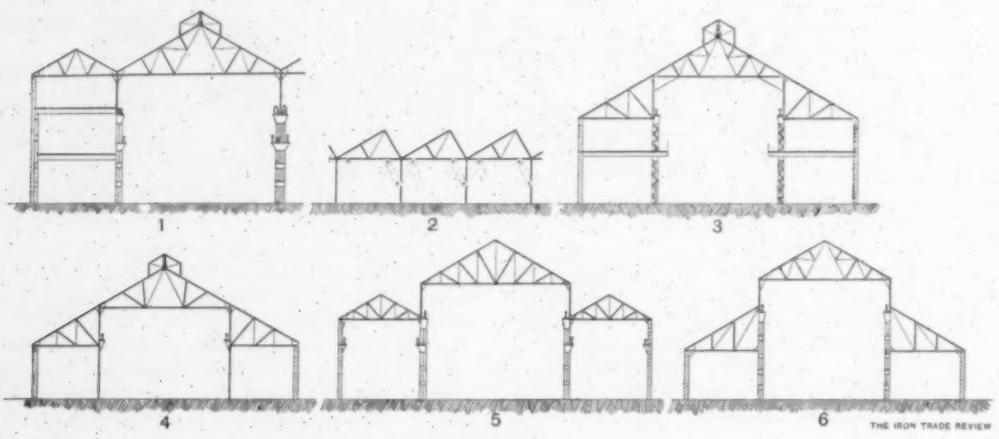


FIG. 9.

(2) To discuss the equipment of buildings particularly in relation to the application of electric power and electric light, and to receive the views of electrical engineers and fire brigade officers as to the origin and prevention of electrical fires, including fires caused by lightning.

(3) To discuss the legislative enactments in force in cities and districts, particularly in respect to the limitation of area or cubical contents for warehouses buildings and workshops, and the means of separating and uniting such buildings, also the means of escape in case of fire; further, to consider particularly the regulations governing the construction and control of theatres and places of public resort, and the provision of staircases and means of escape for the audience and employes; as also the regulations governing the construction of dwelling-houses and houses let in tenements, and the amount of fire resistance to be provided and the means of escape in case of fire.

(4) To discuss the best means of watching or inspecting buildings and plant exposed to fire risks without undue inconvenience to owners and occupiers, the practice of fire brigades in this direction, and the experience of the various fire patrol systems.

(5) To discuss the practice in respect to insurance against fire; to ascertain the systems adopted in various countries; the risks insured against; the regulations and requirements of

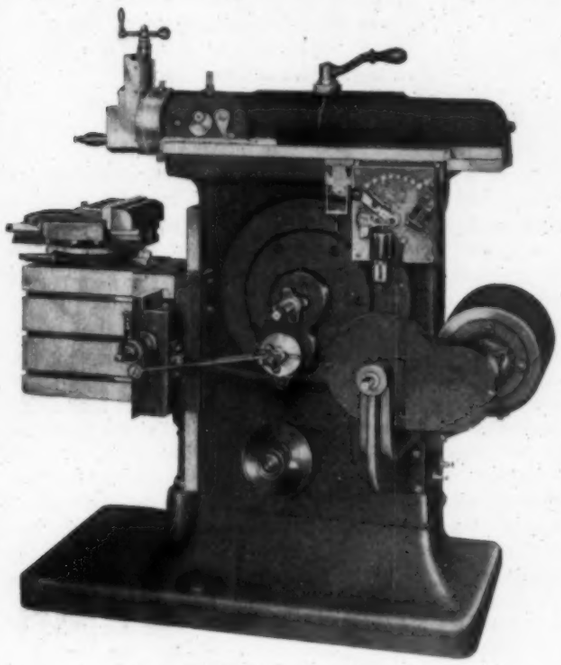
the national, municipal, public and private insurance corporations, and to inquire into the systems of mutual insurance, the precautions taken against incendiarism, the statistical record of fire losses, and the preparation of uniform fire maps and plans.

(6) To discuss the best means of recording the causes and effect of fires, and tabulating the results, so that a basis for comparison may be obtained and standards compiled for various degrees of fire-resistance required in different buildings and suited for various materials; to discuss the best methods of testing materials and recording the facts of such tests for the information of those engaged in the construction, use, and protection of buildings from fire.

The secretary of the British Fire Prevention Committee may be addressed at 1, Waterloo Place, London, S. W.

A NEW 24-INCH SHAPER.

The new 24-inch back-geared combination crank shaper brought out by the Stockbridge Machine Co., of Worcester, Mass., is shown in the illustration as equipped with a Storey motor and capable of a speed variation of 200 percent—the combination closely approximating the same efficiency at either low or high speeds and by the change of but one gear a speed variation of 400 percent may be obtained, giving a



A NEW MOTOR-DRIVEN SHAPER.

speed to the driving shaft of from 75 to 450 revolutions. The ram is fitted with an entirely new crank motion which has some novel features. This motion is capable of a 4 to 1 quick return and gives an even cutting speed at all parts of the stroke. The ram is of the box pattern. It is 44 inches long, 12 inches wide, and has a bearing of 33 inches in the column when at full stroke. The position of the tool is readily changed from the front of the machine. The column is of the latest box pattern. It is extended 4 inches on top in front, and is very deep, giving a bearing surface for the ram of 36 inches. It has a very large base, which extends well out under the table.

The stroke is 24 inches, and can be readily changed from front of machine, an index and pointer in plain view showing the length of stroke. The head which carries the tool has its swivel accurately graduated, and can be set to any angle, and is clamped in position by two bolts, which hold it perfectly rigid. The slide has a travel of 9 inches, fitted with automatic feed. The screw is provided with graduated collar, which reads to sixty-fourths of an inch. The collar is so arranged that it can be set to read from zero at all times, without regard to the position of screw. When using the automatic feed to head, the dog which operates the pawl should be set so as to do its work at the extreme end of the return stroke, as it will give the best results in this position. The table is of the box form, with working surface on top 14x20 inches, and one side 14x15, which have three T slots for clamping work. The table can be readily removed from the saddle, which also has three T slots for clamping work to it. All T slots are cut from the solid metal. The cross-feed is 30 inches in length, and is automatic in either direction. The feed is operated through a rod which adjusts itself to any position of the bar. The screw is fitted with graduated collar reading to sixty-fourths of an inch, the same as on the down feed. The vertical movement of table is 15 inches, by means of beveled gears and a double screw, which is an improved device, and does away with the necessity of cutting a hole in the floor, which is a great objection in fireproof buildings or where the machine is set on concrete floors. The screw is provided with ball bearings, which make it very easy to operate.

The rocker arm is made so that a 3-inch shaft can be passed through under the ram for keyseating, a very desirable feature.

The vise is of the swivel-base pattern, and is clamped in any position by two bolts. It has a graduated base and can be set at any angle. It is clamped to the table by two bolts fitting in the T slots, and can be used on side or top of table. The jaws are steel faced. The screw for operating the movable jaw is covered at all times, thus being protected from dirt and unnecessary wear.

The driving cone has four steps for 3-inch belt, the largest step being 14½ inches in diameter. It is supported between two bearings, one on the column and an outboard bearing, which make it very rigid. The countershaft is provided with self-oiling boxes, and has tight and loose pulleys 14 inches in diameter for 4-inch belt, and should run 260 revolutions per minute for cast iron.

All parts are given a close inspection while building, and every machine is put under the belt and carefully tested before leaving the works. All gears and T slots are cut from the solid metal; all bearings are very large, and all flat-sliding fits are hand-scraped.

The finished weight of machine and countershaft is about 3,600 pounds.

M. M. Garland on Stock Holding by Employes.

M. M. Garland, former president of the Amalgamated Association of Iron, Steel and Tin Workers, has made a strong declaration approving the principle of stock-taking by employes. He says in part: "To me the principle of stock-taking by employes is the American plan of equality between workmen and capitalists. It is practical, not theory, it is co-operation that co-operates. It is a voluntary investment, not a retention of wages. It means the reaping of deserved premium and not an additional charity offering by the employer. It means the earned pension that enables men to stand erect and forms an incentive for men to strive to become owners rather than recipients of industrial pensions granted them for docile and long servitude, with many provisions attached and which at best cannot incite men to their best efforts nor awaken a greater ambition than simply exist until taken care of. Stock-taking obliterates the degenerating influences of preached paternalism, and while it may minimize the number of strikes by bringing about a better conception of existing trade conditions, yet experience has taught that shareholding workmen will strike against a real intrusion of their rights as readily as would a non-holder."

Three of the most important locomotive building firms in Scotland—Neilson, Reid & Co., Dubs & Co., and Sharp, Stewart & Co.—employing between them 7,000 men, have amalgamated their plants with a capital of $10,000,000. There are now only three British locomotive builders of any consequence outside the combine.

Information was given out at Springfield, O., to the effect that the grain drill combine to have a capital stock of $20,000,000, has practically collapsed because firms could not agree on the value to be placed on respective plants.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

Toolpost Grinder for Wet Grinding.

The halftone in Fig. 1 shows a lathe toolpost and slide, removed from the carriage, and a simple arrangement held in the slot of the former for use in wet grinding. Toolpost grinders are not broadly novel, as the phrase goes, but the addition of a water hood with the necessary attachments is new and allows the use of the grinder in the case of thin cutters and for similar purposes where there is any danger of drawing the temper of the work on the lathe centers. The water hood is equipped with an adjustable spout which may be so set that the water will impinge between the wheel and the work on any size of wheel used. The hood may be readily removed, when ordinary dry grinding can with safety and speed be employed.

The grinder is made with a hardened and ground spindle

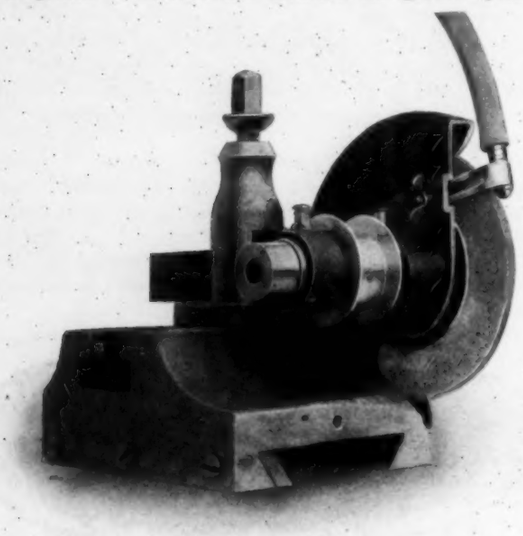


FIG. 1.—TOOLPOST GRINDER.

running in adjustable bronze dust proof bearings and the outfit generally is sufficiently substantial to meet the requirements of shops which do not have work enough to warrant the purchase of a universal grinding machine. The overhead drum for these grinders is quite a novelty in its line and suggests many further applications of the idea beyond the field of countershaft design. The countershaft drum is often a makeshift affair, not infrequently made of wood and just as often of doubtful accuracy. The Grant Mfg. & Machine Co., of Bridgeport, Conn., maker of this wet grinding device, has the drum made entirely of sheet metal, giving a perfectly balanced result—a light smooth running drum which is safe at all speeds. It is here that a chapter seems to have been taken to good advantage out of the experience of manufacturers of textile machinery where the light and wonderfully strong band drums are freely introduced.

A Screw-Cutting Die.

The illustration shows a screw-cutting die of the class in which the die proper is made distinct from the die-plate and is readily connected or disconnected from the holder. The lower portion of Fig. 2 shows a vertical section of one half of the die, the part A of the plan view. The general scheme is very simple, and is directed at the usual purpose of a provision for expanding the die to change the size of the screw that is to be cut and also admit of easily dividing the die into two parts when it is desired to sharpen or otherwise repair it. The die is made in two halves, A and B. The two parts are held together by a hinge pin C having flanges at each end. This hinge pin is so made that it fits with a strong frictional grip to the parts A and B so that when the parts are put together with the pin C in the socket D they will be securely held and accurately maintained in their respective positions. A coned adjusting pin is adapted to engage with the socket E and serves by means of the taper to adjust the parts A and B and

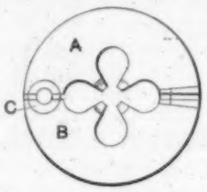


FIG. 2.—A SCREW-CUTTING DIE.

hold them against the pressure of the die plate in the usual manner.

The die may be taken out of the die plate when it is desired to sharpen or otherwise repair the die, the two parts A and B pulled apart and fixed and then crowded together again, the cling of the hinge pin serving to hold the die. This arrangement is the subject of a patent by H. J. Hjorth, of Cambridge, Mass.

Monkey Wrench.

L. S. Starrett, of Athol, Mass., has patented a time and patience saving improvement on screw wrenches, which is illustrated in Fig. 3. The object of this device is to take up the backlash which accompanies the wear as well as the loose fit—and "fit" is here a very liberal term—usually allowed between the working parts, a looseness which gives considerable play to the movable jaw relatively to the head or fixed jaw of the wrench. The wasted time and patience which go with this condition are well known to mechanics and the present improvement consists in providing the wrench with a spring serving to take up this looseness and forcing the movable jaw away from the fixed one, giving firmness to the working action of the wrench in taking up the slack. The wrench is equipped with a hollow screw with a spiral spring extending

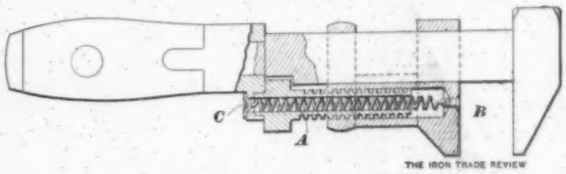


FIG. 3.—MONKEY WRENCH.

through head and body of the screw. One end of the spring is secured to the movable jaw and the other end is connected to a fixed projection on the handle. The contraction of the stretched spring draws the movable jaw backward and takes up the backlash. Fig. 3 shows such a monkey-wrench with a spiral spring A extending through the screw and secured at each end and under tension in order to draw the jaw and screw away from the fixed head. The ends of the wire spring are shown attached to the jaw by a headed stud B and to a projection on the handle ferrule by cap C. This projection is recessed for the coils of the spring to pass through it so that it may be removed and a new one inserted when this is required. The construction allows a long spring which has increased ef-

ficiency and will thus readily yield to the variations of tension incidental to different adjustments of the jaw and, on the other hand, there is nothing about the improvement to interfere with the ordinary usefulness of the tool. The spring is also enclosed within the screw and movable jaw where nothing can harm it, while the tool is correspondingly lightened by making the screw tubular.

Reamer for Turret Use.

When a finishing reamer is used in a turret machine it is necessary to allow some lateral play in the support to provide for correct centering in the work and when the reamer is of large diameter and therefore heavy the natural tendency is to sag downwards so that on entering the work the weight causes it to cut most deeply at the lower side. This distortion gradually decreases as more of the body comes into bearing upon the surface of the bore and becomes a minimum when the entire length of the cutting blade is in contact. The same thing happens as the action is reversed and the reamer emerges from the hole, this sagging continuing until the work is cleared. J. N. Lapointe, of Hyde Park, Mass., has devised an invention to counteract this source of inaccuracy and this

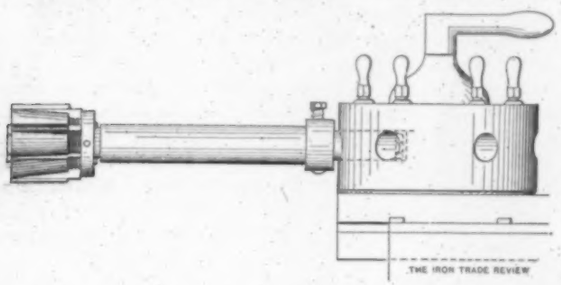


FIG. 4.—REAMER APPLIED TO TURRET.

improvement is illustrated in Figs. 4 and 5. The former shows one form of this improved support applied to the turret of a screw machine, and Fig. 5 is a vertical section through the supporting bushing and the reamer shank. The body of the reamer A is reduced at the shank B and ends in a threaded portion which is still further reduced to pass through the supporting bushing D; the shoulder between the end of B and D being cupped out to a curved surface. A tapered pin E fits closely in the part A and extends through the bushing D, the tapered pin E having an adjustment nut and spiral spring at the upper end. The diameter of the pin and the openings in the bushing being such that the former will have some lateral as well as endwise movement to allow the play of the shank in the bushing in all directions.

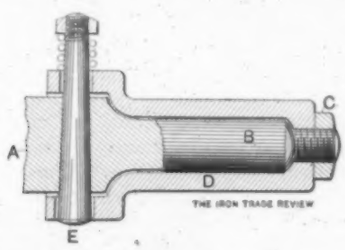


FIG. 5.—SECTION OF FLOATING REAMER IN TURRET BUSHING.

The bushing is clamped in one of the openings in a turret as shown in Fig. 4 and the reamer so located that the pin E is in a vertical direction. The tension of the spring is then adjusted by turning the nut until the shank is out of contact with the side wall of the bushing and the reamer is held in a horizontal plane and centrally of the work. The tool may then be fed into the opening to be operated upon by advancing the turret in the usual manner; the rounded surface of the shoulder rocking upon the inner wall of the bushing as the head centers. The pin E prevents the rotation of the shank in the bushing and by securing contact of this pin in the enlarged portion at points considerably removed from the center the chattering of the tool is avoided with the aid of the nut C.

Cross Feed for Shaper.

A cross feed for shapers has been patented by George J. Meyer, of Milwaukee, and assigned to Gould & Eberhardt, of Newark, N. J. A machinist with a job on the table of a shaper wants to get up as close as possible to the work, particularly if he has a little irregular cutting to do and this work, by the way, has a habit of coming frequently in the direction of the shaper. The two operating handles, for the down feed of the head on the ram and the cross feed of the table, are placed at the extreme limit of the height and width of the machine and it is inconvenient to handle the two to any

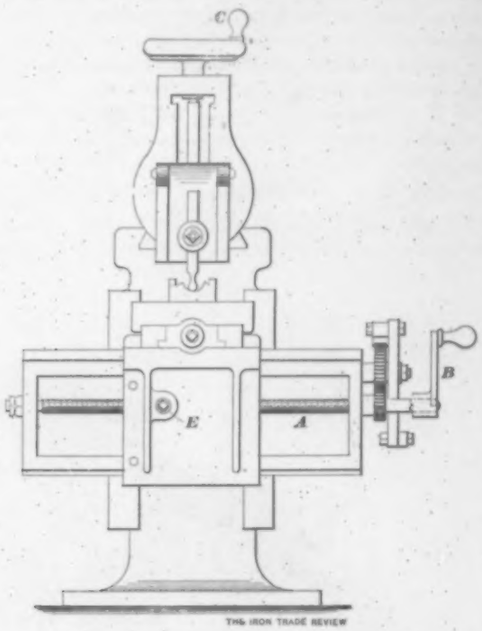


FIG. 6.—FRONT ELEVATION OF SHAPER.

advantage at the same time and watch the work, yet for regular surfaces this may often be desired. The present improvement provides a convenient means of operating the horizontal feed to the table and at the same time working the vertical feed of the tool slide. Fig. 6 is a front elevation of the machine equipped with the improvement in question, and Fig. 7 is a horizontal section, upon a large scale, of the carriage. Attention may here be called to the fact that the inventor shows alternative constructions but the one selected for illustration is fairly descriptive of the scheme in general. The

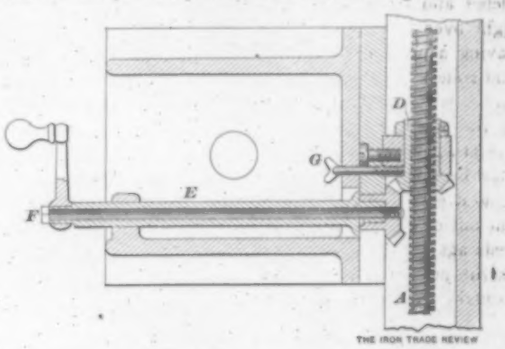


FIG 7.—SECTION OF SHAPER CARRIAGE AND TABLE WITH NEW CROSS FEED.

carriage is fed along by a screw A which may be operated by power through feed gears or by a handle B at the extreme right. The tool post and slide are fed downwards by a hand wheel at C.

The table is shown with a die in the vise, the curved surfaces of the work requiring the simultaneous feeding of the tool in the two directions. The nut D of the cross feed screw is shown as fitted to rotate in a bearing on the carriage and connected by bevel gears with a spindle E. When the screw A is turned by the handle B the nut stands still and the carriage

is fed along by the screw; but when the nut is turned by the spindle E the screw stands still and the carriage is fed along the screw by the nut.

A bolt F extends through the spindle and is threaded into the gear at the end of the socket. The bolt has a head at its outer end and thus serves to draw the spindle firmly into the socket upon the gear and clamp the two together, the spindle and its key then operating to rotate the nut when the spindle is turned. It is necessary to remove the table and vise when it is required to bolt a piece of work directly upon the carriage and the removal of the bolt F permits the spindle E to be removed at the same time. The carriage is then fed by turning the screw A and the nut is held from rotation by means of a thumb screw G.

The operator, with the aid of this construction, can work the vertical feed with the right hand and the horizontal feed with the left if he should so choose and his body is then brought into a position where he can comfortably follow the progress of the work.

Belt-Shifter.

J. J. Leahy and Arthur Parmitter, of Adelaide, South Australia, have a method of transferring belts, as it is termed in

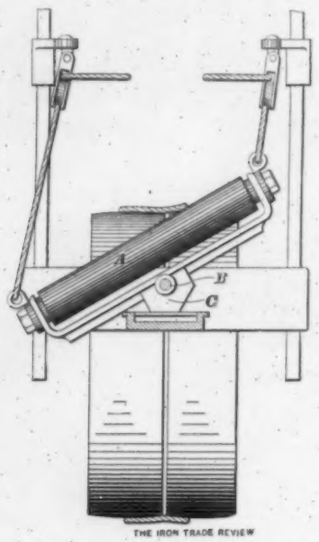


FIG. 8.—AN AUSTRALIAN BELT SHIFTER.

the specifications, which in one form is shown in Fig. 8. The device is seen at the point when the transfer is almost completed and the belt has been moved from the pulley on the right over to the left. The arrangement consists of a frame having a pivot in the center which supports a rocking frame and roller. The roller is seen at A; B is the supporting pivot and C is a cam resting against a spring. There are eye pieces at the ends of the roller support to which are attached the operating cords by which the carrier is handled. The roller A may be formed of a length of brass tube fitted with an iron plug at each end and when not in operation the roller lies near but out of contact with the inner face of the belt. The cam C rests against the flat spring, which assists the operator as soon as the point has passed the center and then serves finally to lock the belt shifter in position.

Plans of the United States Steel Corporation.

An official of the United States Steel Corporation in discussing the plans of the management for the current year is reported as saying: "During the next year, it is probable that $50,000,000 will be spent in centralizing and modernizing our mills. Plans are now being considered for the expenditure of about $10,000,000, at McKeesport, Pa., and a like amount at Lorain, O. This money will undoubtedly be spent whether or not the bond conversion plan is carried out. Within the next few weeks announcement will probably be made of the acquisition of further large ore deposits, negotiations for which are now progressing satisfactorily."

TRADE PUBLICATIONS.

The 1903 catalogue of the M. Rumely Co., of LaPorte, Ind., describes the traction engines, water tanks, pumps and a general line of threshing machinery. The catalogue is prettily illustrated with many excellent halftones, and we learn that three double cylinder engines have been in constant use the past six months on the World's Fair grounds at St. Louis, for grading and similar purposes.

The Phoenix Mfg. Co., of Hartford, Conn., has just issued a circular describing a single spindle centering machine and a small traverse drill. These are sold separately, but when so desired may be furnished in combination. The single spindle centering machine has a capacity from ⅛ up to 4 inches, and occupies a floor space of 32x15 inches. The small traverse drill has a verticle adjustment of the table to 3½ inches and a movement of the spindle to 2 inches, and can be used for a variety of light drilling and milling purposes. The counter designed for these machines is a very compact affair and has quite a neat belt shifter. A goodly portion of the circular is devoted to a letter telling how centering is usually performed and how much better and quicker it may be done with the aid of suitable machinery.

A souvenir of the inspection trip made by the American Society of Civil Engineers to the new terminal of the North German Lloyd Steamship Co., at Hoboken, during the annual meeting held in New York City, Jan. 21 and 22, 1903, is being sent out with the compliments of the Joseph Dixon Crucible Co., of Jersey City, N. J. The souvenir contains a description of the buildings in detail, together with some account of the equipment, and is adorned with attractive halftones showing the work at different stages of the construction.

The Philadelphia Pneumatic Tool Co., of Philadelphia, has several new circulars in regard to the Keller pneumatic tampers for use on copper converters as well as on steel converters. It has been found that the rammers originally designed for foundry purposes and tampering concrete and clay have developed a considerable demand for such tools in smeltering and Bessemer steel plants, the service of course, being that of tamping the linings and bottoms of converters. A 6x9 pamphlet has also been prepared by the same company and is entitled "The Care and Use of Pneumatic Tools." While this pamphlet has special reference to the Keller tools, it will be found worthy of study by users of any make of pneumatic apparatus.

The catalogue of the Foster Engineering Co., is a 6x9 publication and extends to some 95 pages, profusely illustrated with engravings of the Foster pressure regulator and kindred engineering specialties. The firm has moved into a new factory and is now better equipped than ever for the manufacture of appliances of this character.

The Northern Engineering Works, of Detroit, has a new crane catalogue, No. 15, which shows a large variety of machines. Among the more prominent are three, four, and five motor electric traveling cranes of from 3 to 50 tons capacity, as well as hand power traveling cranes, jib cranes and locomotive cranes of standard designs. The catalogue is of standard size, 6x9 inches, of 50 nicely illustrated pages.

The Westinghouse Electric Pneumatic system for controlling railway and other motors as designed and built by the Westinghouse Air Brake Co., of Pittsburg, is the subject matter of a special publication which has been prepared with all the scrupulous attention to detail which marks the typographical work of this company. An illustrated book has also been brought out by the same firm relative to the operation and inspection of the Westinghouse multiple train control system for electric railways. Both these publications have many admirable illustrations.

A circular, No. 35, of the Newton Machine Tool Works, Incorporated, Philadelphia, is of standard size and describes a new method of key seating. This refers to a double spindle milling machine, which produces entirely the same results as a cotter milling machine and does it in very much quicker time. These machines are made in two sizes: No. 1, cutting key ways in shafts up to 4 inches in diameter, and No. 2 will cut key ways in shafts up to 8 inches in diameter. The remainder of the circular exhibits a neatly arranged series of halftones in miniature, showing the varied products of this company.

A NEW RADIAL DRILL.

It is of course very desirable in radial drills to have the deflection of the supporting parts of the drill head reduced to a minimum and one designer, A. Mill, M. E., of the firm of Ross & Mill, of Cincinnati, has handled this important problem by bracing the column in the effective manner shown in the illustration. The inside column extends through the outside sleeve and is rigidly connected with the supporting back brace which carries the cone pulleys. This arrangement dispenses also with the overhead countershaft, and allows the cone belt to be shifted easily from step to step, exactly in the same manner as on upright drills. The shape of the back back brace permits also the convenient application of an electric motor or a positive variable speed drive. There is no appreciable spring in the base, neither in arm; as both are uncommonly deep and heavy, strongly ribbed, and the latter is of such a sectional shape that any ordinary torsion and bending stresses are practically overcome.

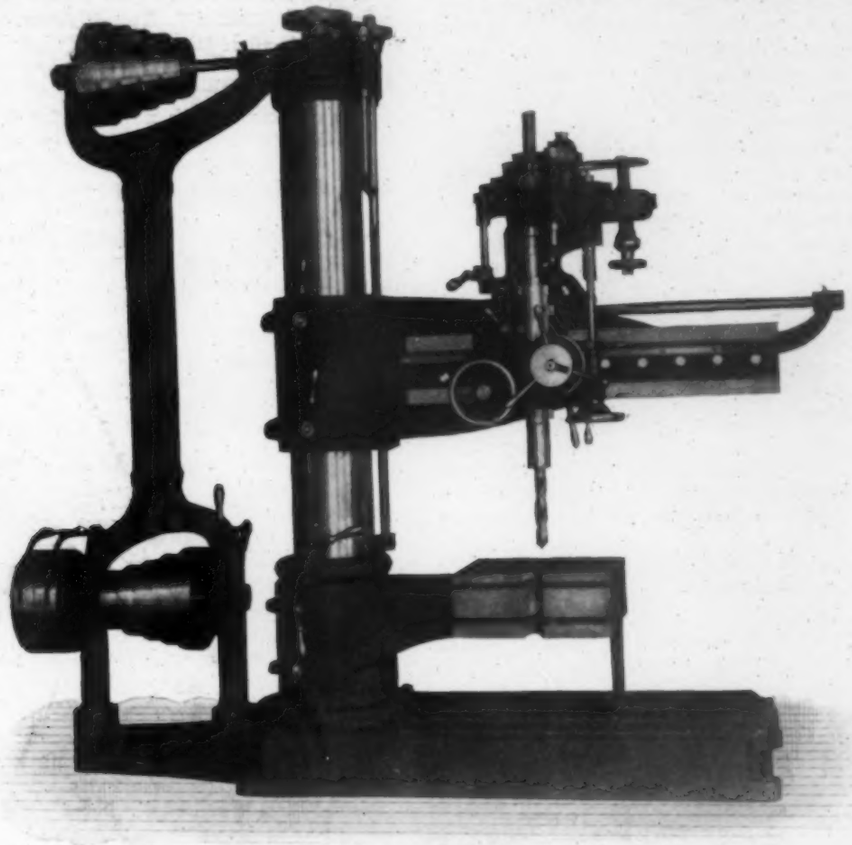
The driving mechanism is arranged in such a manner that all shafts are always running at slow speed; even when the spindle is rotated with a velocity of 400 revolutions per minute, the other shafts will not make more than about 180 revolutions. This makes the machine running comparatively noiseless in comparison with other machinery. This is a feature of considerable importance, as the durability of any machine depends upon the speed and the consequent wear and strain of its moving parts.

The high speed attachment can be thrown in when the machine is running; also the back gearing and medium speeds. As the back gear is attached direct to the spindle, power is transmitted with very little strain, in all the unavoidable long driving shafts, and in an easy manner permits the heaviest duty, as tapping, boring and facing large holes. The sensitive and adjustable friction clutch allows an instant reversal of the spindle for tapping, and, after the tap has started to back out, the highest speed can be used to remove it entirely. The spindle has 15 different speeds from 8 to 400 revolutions per minute which are easy to change.

There is a positive feed of eight changes from 0.005 to 0.059 inch per revolution of spindle. The four low feeds are produced when the machine is running by simply turning a small hand wheel until a finger drops into the notch where the desired feed is indicated. The four faster feeds are obtained by moving up the hand sleeve on the worm shaft. The spindle is also provided with a safety and automatic stop.

The power feed can be thrown out instantly and the hand feed used. For the quick return and approach of the spindle an adjustable clutch in the back of the pilot handle will allow the workman to do such operations in a second, by pushing one of the pilot handles and turning it in the desired direction. This clutch can be adjusted so the breakage of the mechanism cannot occur. The head is movable on the arm by means of the handwheel and compound gearing engaging with a rack, and a binding screw will secure it safely with its full bearings on the arm.

The table is T-slotted at the top and on both sides, is supported at its end and provided with a V in front to take up round work and have it set square at once. It can be oscillated aside to make room for the entire base surface. The table also has in its center a bored hole for boring bar bushings. All the handles and hand wheels are in easy reach, and the following operations can be performed by the operator without leaving his place, with one hand, and instantly: throwing in back gear, throwing in medium speed, throwing in high speed, elevating and lowering arm, moving head and arm, reversing spindle, quick approach or return of spindle, feeding by hand, throwing in the power feed, changing the eight feeds, clamping arm on to column, clamping head on to arm, clamping sleeve on to inside column, etc.



A NEW RADIAL DRILL.

George Greer and Stewart Thompson, of New Castle, Pa., have been appointed receivers of the Frankford Steel & Forging Co., of Eddystone, Pa. Suit was brought by Mrs. A. M. Devine, a stockholder, against Adam Tyndel and W. I. Morris, of Philadelphia, said to hold controlling interests in the Frankford company and the Tyndel-Morris Co., of Philadelphia.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

In addition to the large quantity of iron and steel plant equipment which will be shipped from this country to India for use in the plant to be erected by J. N. Tata, who recently visited the United States, it is reported that Mr. Tata will purchase a large amount of machinery for use in coal mines in India which he will develop. His office in this country is at 88 Wall St., New York.

The Wilmot Castle Co., Rochester, N. Y., has been incorporated with a capital of $100,000 to manufacture sheet metal specialties.

The Union Machine Works, Oakland, Cal., have been incorporated with a capital of $50,000. The following directors have subscribed $6,000 each: A. J. Bradley, Hugh Hogan, H. Schlueter, Anastasia Hogan and Hugh W. Hogan.

The Ideal Stove & Foundry Co., Daleville, Ind., has increased its capital stock from $25,000 to $40,000.

The Miller Improved Gas Engine Co., Springfield, O., has increased its capital stock from $25,000 to $60,000. Extensive improvements will be made.

The Bowan & Streef Equipment Co., Norfolk, Va., has been incorporated with a capital of $100,000 to manufacture, buy and sell and exchange railway equipment, and to operate a machine shop for the repair of locomotives.

The Wolverine Brass Co., Grand Rapids, Mich., has increased its capital stock from $50,000 to $75,000, and will build an addition.

The Cummins Iron Works & Supply Co., of Walterboro, S. C., has been chartered to operate an iron works and to manufacture and repair vehicles on a capital of $10,000. The officers are: O. M. Reed, president; G. W. Raysor, vice president; W. J. Fishburne, secretary; C. T. Cummings, treasurer and business manager.

The Noyes F. Palmer Mfg. Co., of Brooklyn, has been incorporated to manufacture machinery. Capital, $250,000, and directors: N. F. Palmer, A. J. Kelting and A. W. Palmer, of Brooklyn.

The Standard Pressed Steel Co., Ogontz, Pa., has been incorporated with a capital of $50,000.

The American Attachment Co., Portland, Me., has been organized to manufacture machines, tools and appliances. The authorized capital is $1,000,000. The president is Eben F. Thompson, Worcester, Mass.

The C. Hanika & Sons' Architectural Iron Works, Muncie, Ind., will be known hereafter as the C. Hanika & Sons' Iron Co., $75,000 capital, paid up. The incorporators are C. Hanika, F. A. Hanika, Harry S. Hanika, Chas. F. Hanika, Albro B. Paul, of Muncie, Ind., and Lawrence Schunck and William Cron, of Celina, O. The concern has been very successful, and with new capital will increase its capacity.

The Crown Casting Co., Marietta, O., has amended its charter so as to do a general foundry business and increased its capital from $50,000 to $100,000. Edwin Jones is president.

The Galena Iron Works Co., Galena, Ill., has been incorporated and will operate a foundry and machine shop. A building has been rented.

The Watkins Machine & Foundry Co., Hattiesburg, Tenn., has increased its capital from $25,000 to $50,000.

The Southern Automatic Machine Co., Atlanta, Ga., capital $60,000, has been granted a charter. The petitioners are Edward S. Munford and Charles S. Conklin.

Norwalk Manufacturing Co., of Norwalk, O., has been incorporated under the laws of Delaware to manufacture machinery; capital, $50,000.

The Crestline Manufacturing Co., capital $50,000; has been incorporated at Crestline, O., by W. R. Boyd, J. Flowers, G. A. Mussellman, Jacob A. Babst and C. E. Stetter.

The Miles Steel & Tool Co., capital $50,000, has been incorporated at Middletown, O., by Wm. J. Miles, Jr., J. W. Shafer, Chas. B. Oglesby, C. Ed. Sebold, and W. D. Oglesby.

The Herzler & Henninger Machine Works, Belleville, Ill., capital, $21,000, have been incorporated for manufacturing coal mining machinery; incorporators, John Herzler, Henry Henninger, and William J. Fenner.

The Quodmaw Development Co., Duluth, Minn., has been incorporated with a capital of $100,000 to explore lands for iron ore.

The Cincinnati Engine & Machine Co., Cincinnati, has been incorporated by Otto Creutz, A. Graeschel, W. Bocher, Frank Matt, H. W. Turtees. Capital $10,000.

The Blytheville Foundry & Machine Co., of Blytheville, Arkansas, has been incorporated. The capital stock is $10,000, of which $2,500 has been paid. H. C. Daniels is president, Elisha L. Sawyer, vice president and J. S. Johnson, secretary and treasurer.

The Minnesota Iron & Construction Co., Bemidji, Minn., has been organized to do a jobbing business in structural and architectural steel, wrought and cast iron work and to build a foundry, the construction of which will be begun next summer.

The Illinois Iron Mining & Furnace Co., of Minneapolis, has been incorporated. The capital stock is $50,000. The incorporators are Charles L. Tweed, Alexander V. Ostrom and E. R. Smith, all of Minneapolis.

Fires and Accidents:—

A large boiler in the malleable foundry of the Southern Car & Foundry Co., Anniston, Ala., exploded Jan. 28th, killing six men and injuring twenty others. Parts of the boiler were blown over buildings a thousand feet from the place of the explosion.

A boiler explosion in the machine shops of the South Pennsylvania Oil Co., at Evans City, Pa., Jan. 28th, wrecked the building, killed one man, and seriously injured two others. The financial loss was $3,000.

New Construction:

Large additions will be made to the Chaplin Wheel Works, Chatham, Ont., which will then be the largest of this kind in Canada.

George Skene, proprietor of the Topeka Bridge & Iron Works, Topeka, Kas., has purchased a site of ten acres in Topeka and about March 1 will begin the erection of a foundry.

F. Felkel, Civil Engineer and Architect, of Pittsburg, is receiving bids for the steel work of a new glass house for T. A. Rodefer, in Bellaire, O., to cover an area of 100x300 feet, and to be four stories high. There are a number of special features in construction which will be given later.

The Miles Steel & Tool Co., Middletown, O., recently incorporated, will at once erect a plant and will manufacture cultivator shovel steel with soft back, and tool steel face and edges. The company will also make steel for punches and dies and dental instruments, and will consume the greater portion of its product of steel by working it up in cultivator shovel supplies, punches and dies, reamers, cutters, and dental tools, etc., all of which will be manufactured under the Miles patents, now owned and controlled by this company. The main plant will contain 10,400 square feet of floor space with extra warehouse room.

The Wheeling Steel & Iron Works, Wheeling, W. Va., are erecting a building, 142x42 feet, at the Belmont plant. In it will be placed one new automatic continuous mill and two heating furnaces.

The Niagara Falls Machine & Foundry Co., Niagara Falls, N. Y., contemplates the erection of a foundry.

Work has been started on a new building, 130x104 feet, for the Schuylkill Bridge Works, at Stowe, Pa. A tool house and store room will also be erected.

Much surprise was caused in Syracuse, N. Y., last week, when it was announced that the Smith Bros. had resigned from the Smith Premier Typewriter Co., and formed a new corporation with $5,000,000 capital for the purpose of manufacturing a new machine. The factory is to be built in Syracuse and it is said that at least 1,000 men will be employed. The Smith Premier Typewriter Co. was officered by Lyman C. Smith, as president, Monroe C. Smith, secretary; Hurlburt W. Smith, treasurer; Wilbert L. Smith, manager. The Smith Premier plant will be operated as before.

The Bowler Foundry & Machine Co., Cleveland, has been

incorporated under the laws of West Virginia with a capital of $500,000, and will succeed the N. P. Bowler Co., which has conducted a foundry for many years. An addition will be built, with the main building 80x300 feet and a 50-foot lean to on one side. The capacity will be 100 tons per day. The plans have been prepared by the Wellman-Seaver-Morgan Co. Two 50-ton cranes will be a part of the equipment.

The Smalley Motor Car Co., Bay City, Mich., recently incorporated with a capital of $50,000 to engage in the construction of gas engines and motors, has purchased five acres and will put up a foundry and machine shop.

Work on the construction of the buildings of the Ironton Engine Co., Ironton, O., was begun last week. The buildings will be of cement with walls 9 inches thick. The main building will be 85x361 feet and will be used as a foundry and machine shop. There will be three other buildings, one 40x40 feet, one 30x40 feet, and the third 40x50 feet, which will be used as boiler rooms, dry-vault for patterns, office, etc.

The contract for the first building to be erected of the Ashland Steel Range Works, Ashland, O., has been awarded. The structure will be one story frame, 50x150 feet, with a brick basement of 86 feet. The manager, Mr. Wharton, states that he hopes to be making ranges by April 1st.

G. D. Berry, St. Joseph, Mo., has purchased the Columbia foundry of that city. He will enlarge the plant to meet the demands of increasing business. The Columbia foundry is one of the best equipped foundries on the Missouri River, being built especially for the handling of heavy castings.

The Collins Iron Works, of New York City, has bought six lots in Long Island City, L. I., as a site for a plant to be erected soon for the manufacture of ornamental iron work.

The Wilks Foundry Co., Toledo, O., will begin work as soon as the weather permits on a new foundry building for light work. The structure will be 110x250 feet.

The Barry Mfg. Co., Muscatine, Ia., manufacturer of button machinery, has let a contract for a large addition, which will be 210x50 feet, of brick, two stories high. The company has just completed a large foundry building which adjoins the site of the new structure.

The machine shops of the Stillmore Air Line at Savannah, Ga., are being constructed of brick, and will be the largest shops of the kind in that vicinity. Connected with these shops will be a foundry equipped for heavy work.

The Rock Island R. R. Co. has obtained options on 900 acres near Moline, Ill. It is the intention, officially announced, to concentrate repair work at Moline and also to build locomotives and cars in a plant to be erected on the land which it is proposed to acquire about March 1 unless unexpected obstacles prevent. The entire expenditure will be about $1,000,000.

The Webster & Perks Tool Co., Springfield, O., will soon begin work on an addition 200x65 feet.

Three buildings that will cost the United States government about $250,000 will be erected at the League Island Navy Yard, Philadelphia, this year. Operations will be started on the buildings in two weeks, and within a month 1,000 men

The Guerber Engineering Co., Bethlehem, Pa., will erect a large foundry and add considerably to its working force.

The American Paving & Construction Co., Philadelphia, will erect a foundry at a cost of $112,000 and a smithy building at a cost of $12,000.

The Pittsburg District:—

Last week a permanent injunction was granted in the case of the Brown Hoisting Machine Co. against the structural iron workers formerly employed by this company at the Isabella furnaces, Etna, of the American Steel Hoop Co. It was testified that by threats and force the non-union workmen were driven away and that they had been otherwise interfered with. Bond was furnished in the sum of $25,000.

A building permit was granted Dilworth, Porter & Co. for the erection of buildings to cost $172,000 to replace the portions of their plant on the South Side recently destroyed by fire. While the permit has just been taken out the work has progressed considerably already.

The annual meeting of the Fort Pitt Bridge Co., whose plant is located at Canonsburg, Pa., was held last week. The profits for the last year amounted to about 40 percent on a capitalization of $400,000. A large portion of the profits are now being expended in making additions to the plant and when they are completed the output will be practically doubled. Officers were re-elected as follows: G. C. Dellenbach, president; H. R. Blickle, vice president and general manager; T. F. Straub, treasurer.

The Pressed Steel Car Co. commenced another suit in the United States Circuit Court against the Standard Steel Car Co., of Butler, Pa., for alleged infringement of patents last week. It is alleged that the patents on low side gondola cars with steel underframes have been infringed upon.

The Western Air Brake Repair Co., of Pittsburg, has applied for a Pennsylvania charter for the purpose of erecting a plant to repair all kinds of air brakes. The plant will be located in this district. A. L. Swift, Stephen Stone and R. W. Anderson are the incorporators.

The Westinghouse Electric & Mfg. Co. has decided to extend its operations in the manufacture of automobile supplies and equipment. For some time the company has been manufacturing various parts for automobiles and the department doing this class of work is to be considerably extended.

The Wabash Railroad Co. has asked permission of Congress to erect another bridge in this district. It is to span the Allegheny River near the Point and will connect the road's Pittsburg terminal with Allegheny. The contract for its erection will not be awarded until after Congress grants permission for its erection.

Workmen employed on an 8-inch mill at the Glassport, Pa., plant of the Pittsburg Steel Co., last week turned out 1,500 bundles of cotton ties. It was a 10-hour turn and the men strained every effort to break their previous best record of 1,471 bundles which they succeeded in doing.

While casting a 50-ton bed plate at the foundry of the Mackintosh, Hemphill foundry last week the casting bed was broken, permitting the iron to run into the ground. The report that the iron broke through an abandoned sewer and flowed into the Allegheny River is denied.

The Pittsburg & Lake Erie Railroad Co. has prepared plans for the erection of a five-story freight depot to occupy a site 400x100 feet. It will be of brick and steel construction.

The Crucible Steel Co. of America has been awarded a contract for supplying a large amount of tool steel to the Bengal and Northwestern railroad of India.

The Pittsburg office of the American Bridge Co. has been awarded a contract for the steel required in ten new shops to be erected by the Louisville & Nashville Railroad at South Louisville, Ky. About 5,500 tons of steel will be required.

The annual meeting of the Washington Coal & Coke Co., of Dawson, Pa., was held last week and officers were re-elected as follows: M. M. Cochran, president; W. Harry Brown, vice president; J. H. Wurtz, secretary and treasurer; J. S. Newmeyer, N. A. Rist, A. C. Sherrard, J. C. Core and E. J. Taylor, directors. At the same time the annual meeting of the stockholders of the Washington Run Coal Co. controlled by the same interests was also held.

McKenna Brothers Brass Co., of Pittsburg, have been appointed sales agents for Western Pennsylvania and West Virginia for tool steel manufactured by the Firth-Sterling Steel Co.

The Pittsburg Valve, Foundry & Construction Co. has purchased the site and buildings now occupied by W. J. Carlin & Co., 25th St. and A. V. Railroad, to be used for a brass foundry and warehouse. The brass foundry will be 130x60 feet. W. J. Carlin & Co. are now negotiating for a site for the erection of a new plant to carry on the manufacture of light locomotives.

James F. McNary, with offices in the Empire Bldg., has been appointed general sales agent of the Diescher shaft coupling.

Work on the erection of the new furnaces of the Union Steel Co., at Donora, Pa., is being pushed to completion as fast as possible. Three shifts of men have now been put to work and the two stacks will be in operation within four to five months.

The Standard Engineering Co., of Pittsburg, whose plant is located at Ellwood City, Pa., has increased its capital

stock to $300,000 to provide for the erection of a foundry. It will have a capacity of 50 tons of gray iron castings daily.

General Industrial Notes:—

The plant of the Standard Bolt & Mfg. Co., Alliance, O., which was built during the past summer, is now being operated almost to its full capacity. About two months ago machines were started to make bolts in an experimental way. Since that date, week by week new machines have been added, and the putting in of equipment is now about completed. The main building of the plant is 70x208 feet, with an annex 34x34 feet. The company has a large number of orders and starts with most encouraging prospects.

T. E. E. Bartlett, Meridian, Miss., has purchased the Martin Machine Works of that city at a cost of $25,000. Mr. Bartlett announces that he intends to increase the capacity of the property and add new manufacturing facilities.

The New Albany Trust Co., assignee for the New Albany (Ind.) Fence & Foundry Co., has sold the plant to Robt. Jackson, of Indianapolis, for $2,150.

The Niles Tool Works Co., Hamilton, O., held its annual stockholders' meeting last week. All the old officers and directors were re-elected and a banquet was held which was attended by the agents and managers of the various branch departments.

The Pennsylvania Trust Co., receiver of the Central Foundry & Machine Co., Reading, Pa., will sell the machinery and stock of the company Feb. 14.

At the annual meeting of the Akron Foundry Co., Akron, O., the following officers were chosen: President, R. A. May; secretary, Frank B. Thiess; treasurer, Frank Fiebeger.

The Russell Engine Co., Massillon, O., has obtained a contract for engines to be shipped to Yokohama, Japan.

The Belfont Iron Works Co., Ironton, O., contemplates establishing a plant for the manufacture of barbed wire, plain wire fencing, wire netting, etc. A building formerly used for other purposes will be utilized.

The Chicago Pneumatic Tool Co. has secured contracts for pneumatic tools to be installed in the Bengal-Nagpur Railroad shops and in the government dockyard at Bombay. Neilson Reid & Co.'s locomotive shops at Glasgow and the plant of the Steel Co., of Scotland, in the same city, are also to be equipped with pneumatic tools made by the Chicago company.

The Birmingham Foundry & Machine Works, Birmingham, Ala., are about to make some large shipments of sugar machinery, crushers and engines to Cuba.

The Wheeling Steel & Iron Works, Wheeling, W. Va., started up last week its steel plant and plate mill, which had been idle for several weeks. This was the regular mid-winter stop, and extensive repairs and improvements were made.

The Enterprise Enamel Co., Bellaire, O., has increased its capital by stock dividends from $100,000 to $200,000. The stock is all invested in additional buildings and machinery, and will be used for the same line of goods as the company has been making, the "Chrysolite" enameled steel ware, and related lines.

At the annual meeting of the stock-holders of the Foster Stove Co., Ironton, O., last week, the following directors were elected: Col. H. A. Marting, Rev. J. C. Marting, Louis E. Marting, C. A. Hutsinpillar, O. P. Doty, A. R. Johnson, and Dr. Clark Lowry. The board organized by electing Col. H. A. Marting as president, Dr. Clark Lowry, vice president, W. H. Foster, secretary, and L. E. Marting, treasurer and general manager. J. D. Foster, president of the company until this meeting and the founder of the company almost twenty years ago, retires, having disposed of his interests to Col. H. A. Marting.

The Joliet Steam Forge Co., Joliet, Ill., began operations last week.

The *National Zeitung*, of Berlin, says an American firm is about to erect a foundry at Magdeburg to make radiators.

The directors of the Wheeling Steel & Iron Co., Wheeling, last week declared a stock dividend of 25 percent and a cash dividend of two percent making a total cash dividend of 10 percent for the year.

The Owen Machine Tool Co., Springfield, O., began operations Jan. 20 in its new building, corner Burt and Pleasant Sts., near the old East Street shops. The General Electric Co. is now installing a plant for lighting the building.

Machinery has been installed at the plant of the Gulfport Foundry & Machine Works, Gulfport, Miss. The specialty will be locomotive and marine repairs.

The Banning Machinery Co., Waco, Texas, recently incorporated, succeeds F. D. Banning, proprietor of the Waco City Iron Works. Required machinery has been purchased.

President S. D. Fitton, of the First National bank, Hamilton, O., has been appointed receiver of the Macneale & Urban Safe Co., of that city. The company is not insolvent, but has not been making money and the stockholders decided to have a receiver appointed and wind up the business.

M. T. Goss, Denver, Col., has organized the Western Boiler & Iron Works Co., of that city, for the purpose of manufacturing everything in which steel plate or sheet iron is used. The company has purchased a complete shop equipment including a steam power riveter capable of fifty tons compression. Mr. Goss has associated with E. B. Hasker, who will superintend construction. Mr. Hasker has had fifteen years' experience as a mechanic and superintendent in large eastern shops. Machinery is now in place.

The Hill Tool Co., of Anderson, Ind., which has been occupying quarters with the Hill Machine Co., on Jackson St., is removing this week to its new plant, corner Chase St. and the Big Four Railroad, three blocks west of the passenger station. The new quarters, which were made necessary by an increasing business, are of brick 44x144 feet, and a 50x60 foot addition besides the office. The Hill Machine Co. manufacturer of pumps, will continue to occupy the old plant.

Three new ore docks will be in operation at Lake Erie ports during the coming season, equipped with latest improved machinery for handling ore. The docks of the Lackawanna Steel Co., at Buffalo, will be ready for business at the opening of navigation, the dock of Pickands, Mather & Co., at Toledo, will be in service early in the season, and the dock of M. A. Hanna & Co., at Detroit, will be equipped soon after the other two.

The Portsmouth Foundry & Machine Works, Portsmouth, O., have been reorganized, the new officers being the following: J. L. Watkins, president; William W. Ricker, vice president; Carl Ricker, secretary and treasurer. The directors are the officers and Chas. S. Hall and Sam'l M. Johnson. Extensive improvements are contemplated.

The demolition of the nail works erected by the American Wire & Nail Co. eight years ago at Duncansville, Pa., has been ordered by the management of the company. The machinery has been shipped to Pittsburg, and the plant will soon be razed.

The new plant of the Iowa Gasoline Engine Co., Waterloo, Iowa, has been completed. Machinery purchased from the O. L. Packard Machine Co., Chicago, has been installed, and the plant was put in operation this week. The company will manufacture 3-h. p. gasoline engines and will also repair, buy and sell second-hand engines, and do machinists' job work.

Orders for additional rolling stock, involving a total outlay of $486,000, have been placed for the Boston & Albany system of the New York Central Railroad.

The Warren Electric & Specialty Co., of Warren, O., has bought the Co-operative bicycle factory at St. Catharines, Ont., and will equip it with new machinery for the manufacture of incandescent lamps.

The Co-operative Stove Co., Bloomington, Ill., has declared a 5 percent dividend. The past year has been one of marked prosperity.

The Big Four railroad has placed an order with the American Car & Foundry Co. for 1,000 coal cars, to be delivered as soon as possible.

The name of the Chas. E. Faeth Co., Sioux City, Iowa, has been changed to the Sioux City Iron Co. The capital stock is left at $150,000, but $50,000 of the stock may be preferred instead of $25,000 as heretofore.

Wale & Eccleston, proprietors of a machine shop at Nebraska City, Neb., have dissolved, Mr. Eccleston retiring. Their successors are Mueller & Nickelson. Mr. Wale has established a new machine shop, equipped with latest kinds of machinery. Mueller & Nickelson are the proprietors of the Nebraska City Iron Works.